THE B&B LINE
TRADE-MARK

WORLD'S MOST COMPLETE LINE
HEATING SPECIALTIES

MODERN HEATING AND VENTILATING

The Bishop & Babcock Sales Co.
4901-4915 Hamilton Ave., N. E.
CLEVELAND, OHIO

INTERNATIONAL

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WORLD'S MOST COMPLETE LINE

Heating Specialties and Ventilating Equipment

For All Services

FIFTH EDITION

JANUARY, 1928

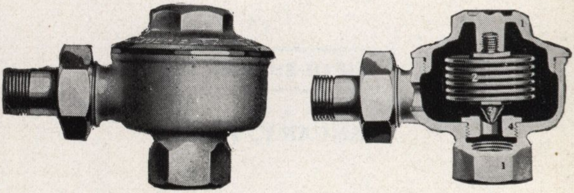
THE BISHOP & BABCOCK SALES CO.
General Offices: 4901-4915 Hamilton Ave., N. E.
CLEVELAND, OHIO

The B & B Line of No. 6 Multiflex-Traps

The No. 6 Multiflex-Trap is a thermostatic return valve which allows the passage of air and water of condensation, automatically and noiselessly, without escape of steam, into the return piping. Positive seating is accomplished by the cone valve and sharp edged seat used, and which insures against the escape of steam.

The No. 6 Multiflex-Trap is supplied in 3 sizes and numerous patterns. Each type is fitted with a Multiflex Thermal Member made from a special composition brass, corrugated into six folds, or corrugations, having 12 flexing surfaces. This distributes the deflection equally over all the surfaces.

The thermal member is filled with a volatile liquid, hermetically sealed under twenty-two inches vacuum and individually tested. Steam in contact with the thermal member vaporizes the volatile liquid, in turn expands and closes the trap preventing escape of steam; air and water of condensation cools the thermal member, and the trap opens, permitting both air and water of condensation to pass, and again closes. Thorough drainage and air elimination are assured with positively the highest efficiency.



Exterior Interior

½", ¾" and 1" Multiflex Traps No. 6

Sizes, patterns, serial numbers and weights of No. 6 Multiflex Traps are as follows:

Size and Type In.	Serial Number	Net Weight Lbs.
½ No. 6 Angle	9305	2
½ No. 6 S. W.	9315	2
½ No. 6 R. H.	9325	2
½ No. 6 L. H.	9335	2
¾ No. 6 Angle	9355	3½
¾ No. 6 S. W.	9365	3½
¾ No. 6 R. H.	9375	3½
¾ No. 6 L. H.	9385	3½
1 No. 6 Angle	9395	4
1 No. 6 S. W.	9405	4
1 No. 6 R. H.	9415	4
1 No. 6 L. H.	9425	4

By the use of No. 6 Multiflex Traps, radiators and coils are always maintained at the steam or vapor temperature, through positive removal of air and water of condensation.

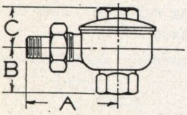
No. 6 Multiflex-Trap

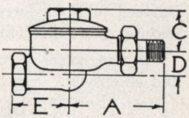
For Low Pressures

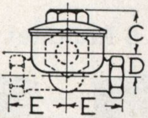
Specifications

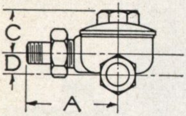
1. Body and cap heavy bronze castings with metal to metal joints heavily nickeled with polished trimmings.
2. Thermal member is special composition brass, heat treated and filled with volatile liquid which expands and contracts according to temperature closing or opening the valve.
3. Cone valve and sharp edge seat made from best steam brass insures positive seating. Extra large valve opening prevents dirt accumulation. Seats are renewable.
4. Each trap provided with an extra heavy swivel and nut containing ground ball and socket joint.
5. Operates on varying pressures up to 15 pounds.

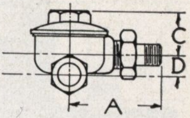
Roughing-in Dimensions











Size	A	B	C	D	E
½"	3⅜"	1⅝"	1½"	¾"	2"
¾"	$3\frac{15}{16}$"	$1\frac{9}{16}$"	1½"	$\frac{29}{32}$"	$2\frac{5}{16}$"
1"	4¾"	1⅞"	1⅞"	⅞"	3¼"

The PERFORMANCE of the No. 6 Multiflex Trap on various types of service is as follows, based on square feet of Radiating Surface.

Size and No.	Direct Radiation		Direct Indirect Radiators		Indirect Radiators		Coil or Wall Radiators	
	Vacu Vapor	Return Line	Vacu Vapor	Return Line	Vacu Vapor	Return Line	Vacu Vapor	Return Line
½"-6	0-150	0-200	0-100	0-140	0-90	0-120	0-120	0-160
¾"-6	151-400	201-500	101-260	141-340	91-230	121-280	121-320	161-400
1"-6	401-800	501-1000	261-550	341-680	231-400	281-600	321-640	401-800

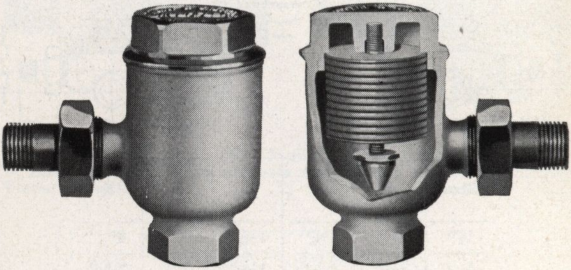
The B&B Line of Multiflex Traps

To meet conditions of sensitiveness for varying steam and vacuum pressures the B & B Line of Multiflex Return Traps is offered. They are essentially a low pressure trap and should not be used where the steam pressure is over 10 pounds. For high pressure see page 8.

The Multiflex Return Trap is a thermostatic valve for use with vapor and vacuum systems of steam circulation. It is used on the return ends of radiators, coils, drip points and on blast heaters. Steam in contact with the thermal member vaporizes the volatile liquid hermetically sealed in the thermal member and closes the valve tightly, preventing the escape of steam. Air and water of condensation cools the member and causes it to contract and open the valve. The Multiflex thermal member is made from a special composition brass, corrugated into thirteen folds or corrugations, having 26 flexing surfaces. This distributes the deflection equally over all the surfaces.

Air and water of condensation are passed noiselessly, automatically and efficiently.

No. 3 Multiflex Trap



Exterior Interior

½", ¾" and 1" Multiflex Traps

Sizes, patterns, serial numbers and weights of No. 3 Multiflex Traps are as follows:

Size and Type Inches	Serial No.	Net Weight Lbs.
½" No. 3 Angle	2355B	2½
½" No. 3 S. W.	4535B	2½
½" No. 3 R. H.	4545B	2½
½" No. 3 L. H.	4555B	2½
¾" No. 3 Angle	4565	3
¾" No. 3 S. W.	4595	3
1" No. 3 Angle	4575	3½

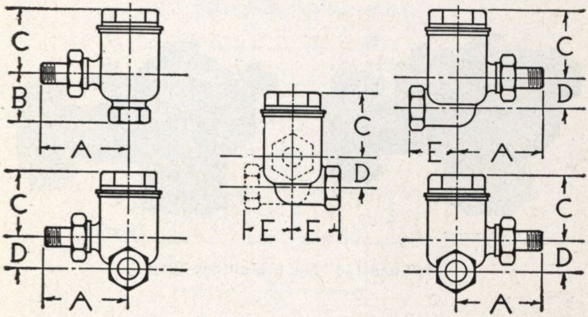
No. 3 Multiflex Trap

For Low Pressures

Specifications

1. Body and cap heavy bronze castings with metal to metal joints, heavily nickeled with polished trimmings.
2. Thermal member special composition brass, heat treated and filled with volatile liquid and hermetically sealed by the B & B process.
3. Conical valve and sharp edge seat, made from best steam brass, insures positive seating. Extra large valve opening prevents dirt accumulation.
4. Each trap provided with an extra heavy swivel and nut containing ground ball and socket joint.
5. Operates on varying pressures up to 10 pounds.

Roughing-in Dimensions



Size and No.	A	B	C	D	E
½″—3	3¼	1⅜	2½	1⅛	1¾
¾″—3	3½	2	3⅜	⅞	1⅞
1″—3	4	2	3¼	—	—

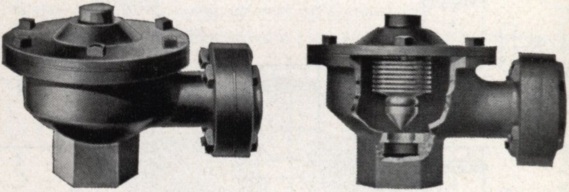
The PERFORMANCE of this type of trap on different work appears in the following table based on square feet of radiating surface.

Size and No.	Direct Radiation		Direct Indirect		Indirect Radiation		Wall and Coil Radiation	
	Vacu Vapor	Return Line	Vacu Vapor	Return Line	Vacu Vapor	Return Line	Vacu Vapor	Return Line
½″—3	0-200	0-250	0-150	0-175	0-130	0-150	0-170	0-200
¾″—3	201-500	251-600	151-350	176-425	131-300	151-350	171-430	201-500
1″—3	501-1000	601-1100	351-700	426-750	301-625	351-700	431-825	501-900

The B&B Line of No. 3 Multiflex Traps

For Low Pressure, 1¼″ and 1½″ Iron Body

A larger size of No. 3 Multiflex Trap for 1¼″ and 1½″ Pipe connections is offered for Industrial uses, and also in connection with the B & B Return Line systems. This trap is equipped with a thermal member of the Multiflex Type made of special composition brass and extra heavy to meet the heavy duty for which purpose it is designed. The thermal member contains the exact quantity and quality of volatile liquid suitable for the service for which it will be used, which expands and contracts according to temperature thus closing and opening the valve.


Exterior Interior

1¼″ and 1½″ No. 3 Multiflex Trap

Sizes, patterns, serial numbers and weights of Type No. 3 Multiflex Trap are as follows:

Size and No.	Serial No.	Net Weight Lbs.
1¼″—3 Angle	665A	15½
1½″—3 Angle	675A	15½

This trap furnished in angle pattern only.

The quantity and quality of the volatile liquid with which such members are filled is of similar importance and the B & B Line is a perfected line in this respect. Perfect flexibility coupled with a perfect volatile liquid produce an evenness of operation in which the B & B Line excel. These features permit the use of an unusually large orifice in the seat of the Multiflex Return Traps, and they handle accordingly a greater amount of condensation than any other return trap of equal size on the market.

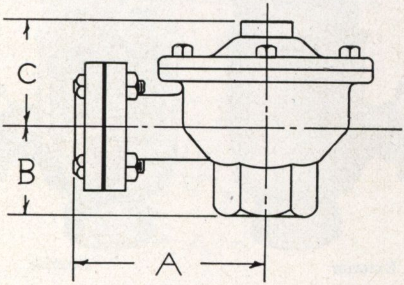
The B&B Line of No. 3 Multiflex Traps

For Low Pressures, 1¼″ and 1½″ Sizes

Specifications

1. Body and cover heavy iron castings. Cover removable and fastened to body by 6 brass cap screws. Traps painted black.
2. Thermal member special composition brass, heat treated and filled with volatile liquid and hermetically sealed by the B & B process.
3. Conical valve and sharp edged seat, made from best steam brass, insures positive seating. Extra large valve opening prevents dirt accumulation. Valve and seat are renewable.
4. Companion flange for inlet furnished as standard equipment. Outlet screwed.
5. Operates on varying pressures up to 15 pounds.
6. Like all B & B products these traps are factory tested and adjusted, there is no adjustment required when installing, or in service. This type of trap is furnished in angle pattern only.

Roughing-in Dimensions



Size Inches	Type	Serial No.	A	B	C
1¼″	Angle	665A	6	2¾	3⅜
1½″	Angle	6/5A	6	2¾	3⅜

The Performance of Type No. 3, Iron Body Multiflex Traps is as follows, based on square feet of radiating surface·

Size	Direct Radiators	Direct Indirect Radiators	Indirect Radiators	Coils or Wall Radiator
1¼ No. 3	1001–2500	681–1600	601–1400	801–2000
1½ No. 3	2501–3500	1601–2400	1401–2000	2001–2800

Above Traps for indirects are for gravity ventilation. For fan systems estimate equivalent direct. C×R÷.25.

Use full opening valves for indirect radiators.

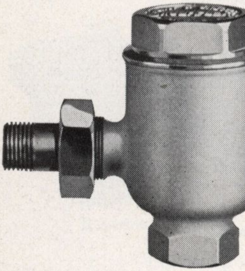
C=Condensation for velocity and final temperature
R=Radiating surface.

The B&B Line of No. 3A Multiflex Traps

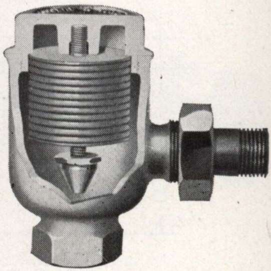
For Medium Pressure

The B & B Line of No. 3A Multiflex Traps is similar to the No. 3 with the exception that the thermal member is especially constructed and filled with the exact quantity of volatile liquid suitable for this service, and which tightly closes the valve on its seat when in contact with Steam.

This liquid must be sensitive enough to contract on contact with higher temperature condensate as met with under higher pressures, and this feature causes the B & B Line of Medium Pressure Multiflex Traps to be decidedly useful.



Exterior



Interior

The sizes, serial numbers and weights in which this Type No. 3A Multiflex Traps are offered are as follows:

Size and Type Inches	Serial No.	Net Weight
½″ No. 3A Angle	6045	2½
½″ No. 3A S. W.	6055	2½
½″ No. 3A R. H.	6065	2½
½″ No. 3A L. H.	6075	2½
¾″ No. 3A Angle	6085	3
¾″ No. 3A S. W.	6095	3

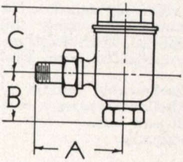
It is impossible to blow out the thermal member, and HIGH Pressures will not injure the thermal member although at above 50 pounds pressure this trap will pass steam. The No. 3A Multiflex Trap is equipped with a monel metal valve and seat. The B & B thermal members making use of liquids that produce definite vapor tensions yield an evenness of operation obtainable in no other way.

The No. 3A Multiflex Trap

Specifications

1. Body and cover heavy bronze castings with metal to metal joints, heavily nickeled with polished trimmings.
2. Thermal member special composition brass, heat treated and filled with volatile liquid hermetically sealed by the B & B process.
3. Conical valve and sharp edge seat insures positive seating, and extra large valve opening prevents dirt accumulation.
   This trap equipped with renewable MONEL METAL valve and seat.
4. Each trap provided with an extra heavy swivel and nut containing ground ball and socket joint.
5. Operates on pressures varying from 25 to 40 pounds.

Roughing-in Dimensions



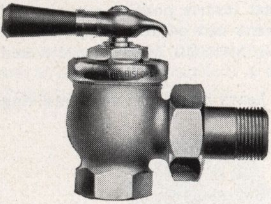
Size andNo.	A	B	C
½″ 3A	3¼	1⅜	2½
¾″ 3A	3½	2	3⅜

Performance:—The No. 3A Multiflex Traps, furnished in ½″ and ¾″ sizes, have the following capacities, based on square feet of radiating surface:

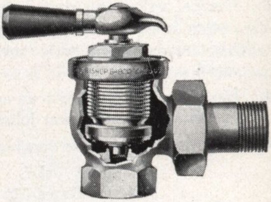
Size and No.	Maximum Capacity Sq. Ft. Direct
½″ No. 3A	100
¾″ No. 3A	200

The B&B Line of Special Multiflex Modulation Valves

The B&B Multiflex Modulation Valve insures of accurate control of steam entering radiators in vapor and vacuum heating installations. The regulation is self-indicated on the dial, from shut to full open. It is all-metal construction, packless and leakage is impossible, there being no packing boxes. Multiflex bellows replace all packing. One-half turn of the lever closes the valve tightly. This valve is a steam and water tight valve, with valve lift obtained by ½ turn, graduated into open, ¾ open, ½ open, ¼ open and shut.



Exterior



Interior

The merits of this valve are tabulated as follows:

1. All-metal construction, handsomely finished in full nickel.
2. Moving parts of special wear-resisting metal.
3. ½ turn of handle opens full from shut to full opening, modulation correct.
4. Large steam port, renewable Jenkins disc, full lift.
5. Packless, multiflex bellows insures a steam and water tight valve.
6. Extra heavy swivel and nut.
7. All parts interchangeable.

Sizes, patterns and weights of the B&B Line of Special Multiflex Modulation Valves are as follows:

Size Inches	Pattern	Serial No.	Weight Lbs.
½	Angle	9485	1½
¾	Angle	9525	1¾
1	Angle	9565	2
1¼	Angle	9605	3
1½	Angle	9645	5
2	Angle	9655	7½

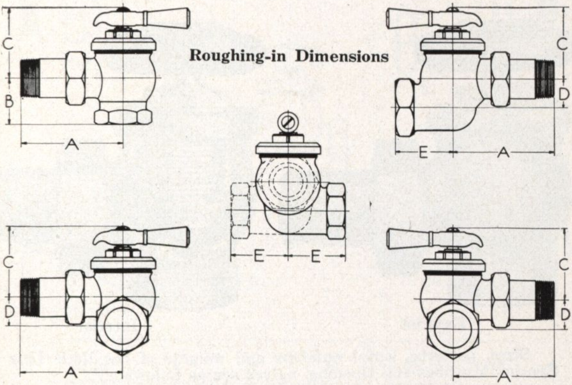
½	S. W.	9495
	R. H.	9505
	L. H.	9515
¾	S W.	9535
	R. H.	9545
	L. H.	9555
1	S. W.	9575
	R. H.	9585
	L. H.	9595
1¼	S. W.	9615
	R. H.	9625
	L. H.	9635

The B&B Line of Special Modulation Valves

Specifications, Roughing-in and Performance Data

1. Body and bonnet of the best steam brass, fully nickeled.
2. Valve stem, stem guide and disc holder of the best steam brass accurately machined.
3. Diaphragm, heavy B&B Multiflex Bellows of special composition brass.
4. Disc holder contains, renewable Jenkins disc.
5. Swivel and nut extra heavy brass, nickeled finished.

All parts are interchangeable, and the trimmings of the valve full nickeled polished. This is a handsome and efficient Modulation Valve.


Roughing-in Dimensions

Size	A	B	C	D	E
½"	2 21/32"	1⅜"	2 13/32"	21/32"	1⅝"
¾"	3 "	1 13/32"	2 15/32"	23/32"	1 11/16"
1 "	3⅜"	1 9/16"	2⅜"	31/32"	1 15/16"
1¼"	3¾"	1 23/32"	3 1/32"	1 "	2⅛"
1½"	4 5/16"	2¼"	3 1/32"		
2 "	4½"	2 9/16"	3 7/16"		

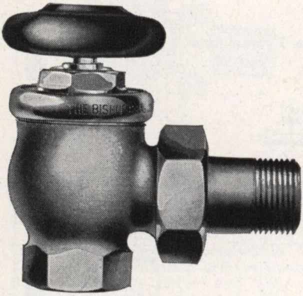
The Performance and capacity of the B&B Line of Special Modulation Valves on different service are as follows:

Size	Direct Radiation	
In.	Vacu Vapor	Return Line
½	0 to 20	0 to 25
¾	21– 60	26– 75
1	61–120	76–150
1¼	121–200	151–300
1½	201–350	301–500
2	351–450	501–650

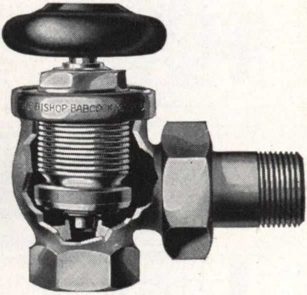
The B&B Line of Special Multiflex Radiator Valves

Full Opening Type

The B&B Line of full opening valves is standard equipment for vapor, vacuum, one and two pipe steam, and for hot water installations. The valve is an all-metal packless type, durably constructed out of the best steam brass, fully nickeled and adjusted, and tested at the factory. The valve contains one Multiflex Bellows Diaphragm surrounding the valve stem. Steam, water and air-tight valves and without the use of gaskets, packing or stuffing boxes. Jenkin discs are used. This type furnished with composition handles, less than two turns of which opens full or closes tight the valve on its seat. All operating parts are not in direct contact with steam or water.



Exterior



Interior

Sizes, patterns, serial numbers and weights of the B&B Line of Special Multiflex full Opening Valves are as follows:

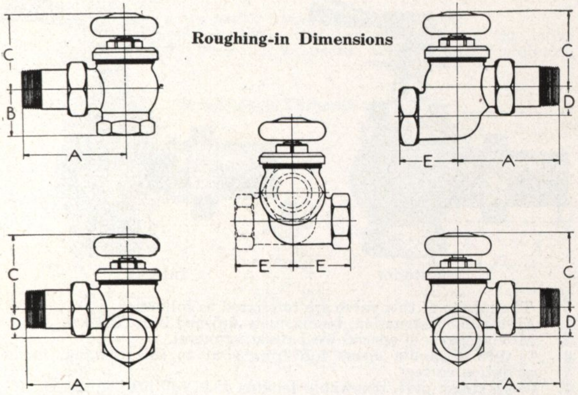
Size Inches	Pattern	Serial Number	Weight Lbs.
½	Angle	9665	1½
½	S. W.	9675	1½
½	R. H.	9685	1½
½	L. H.	9695	1½
¾	Angle	9705	1¾
¾	S. W.	9715	1¾
¾	R. H.	9725	1¾
¾	L. H.	9735	1¾
1	Angle	9745	2
1	S. W.	9755	2
1	R. H.	9765	2
1	L. H.	9775	2
1¼	Angle	9785	3
1¼	S. W.	9795	3
1¼	R. H.	9805	3
1¼	L. H.	9815	3
1½	Angle	9825	5
2	Angle	9835	7½

The B&B Line of Special Full Opening Valves

Specifications, Roughing-in and Performance Data

1. Body, bonnet of the best steam brass, fully nickeled.
2. Valve stem, valve stem guide and disc holder of best steam brass, accurately machined.
3. Diaphragm, heavy B&B Multiflex Bellows of special composition brass.
4. Valve, Jenkins disc, held in disc holder.
5. Swivel and nut, extra heavy, finished in nickel.
6. For pressures up to 25 pounds.

All parts interchangeable, the valve being factory tested and adjusted.


Roughing-in Dimensions

Size	A	B	C	D	E
½ ″	2 21/32″	1⅜″	2 17/32″	21/32″	1⅝″
¾ ″	3 ″	1 13/32″	2 19/32″	23/32″	1 11/16″
1 ″	3⅜″	1 9/16″	2½″	31/32″	1 15/16″
1¼″	3¾″	1 23/32″	3 5/32″	1 ″	2⅛″
1½″	4 5/16″	2¼″	3 5/32″		
2 ″	4½″	2 9/16″	3 9/16″		

The performance and capacity of the B&B Line of Special Full Opening Valves on the different heating systems on which it may be used as follows:

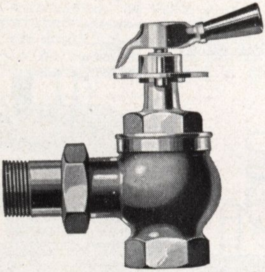
Square Feet of Radiation

Size In.	Vacu Vapor	Return Line	One Pipe	Hot Water
½	0 to 20	0 to 25		
¾	21– 60	26– 75		0 to 21
1	61–120	76–150	0–30	21– 55
1¼	121–200	151–300	31– 60	56–150
1½	201–350	301–500	61– 80	151–225
2	351–450	501–650	81–130	226–

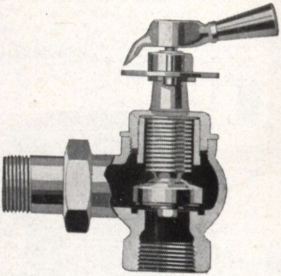
Made in the following patterns: Angle, straightway, right and left hand.

The B&B Line of Multiflex Modulation Valves

The B&B Multiflex Modulation Valve insures of accurate control of steam entering radiators in vapor and vacuum heating installations. The regulation is self-indicated on the dial, from shut to full open. It is all-metal construction, packless and leakage is impossible, there being no packing boxes. Multiflex bellows replace all packing. One-half turn of the lever closes the valve tightly. This valve is a steam and water tight valve, with valve lift obtained by ½ turn, graduated into open, ¾ open, ½ open, ¼ open and shut.



Exterior



Interior

The merits of this valve are tabulated as follows:

1. All-metal construction, handsomely finished in full nickel.
2. Moving parts of special wear-resisting metal.
3. ½ turn of handle opens full from shut to full opening, modulation correct.
4. Large steam port, renewable Jenkins disk, full lift.
5. Packless, multiflex bellows insures a stream and water tight valve.
6. Extra heavy swivel and nut.
7. All parts interchangeable.

Sizes, patterns and weights of the B&B Line of Multiflex Modulation Valves are as follows:

Size Inches	Pattern	Serial No.	Weight, Lbs.
½	Angle	6335	2
¾	Angle	6345	2½
1	Angle	6355	3
1¼	Angle	6365	6
1½	Angle	6435	7
2	Angle	6445	

½	S. W.	6685
	R. H.	6695
	L. H.	6705
¾	S. W.	6715
	R. H.	6725
	L. H.	6735
1	S. W.	6745
	R. H.	6755
	L. H.	6765
1¼	S. W.	6775
	R. H.	6785
	L. H.	6795

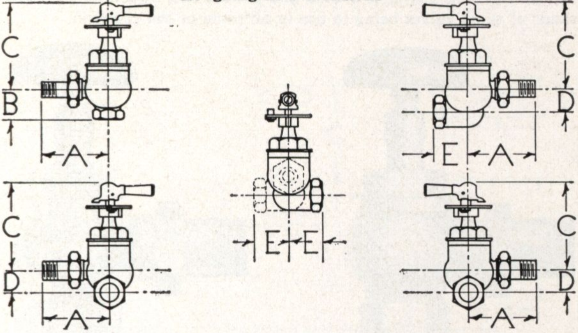
The B&B Line of Modulation Valves

Specifications, Roughing-in and Performance Data

1. Body and bonnet of the best steam brass, fully nickeled.
2. Valve stem, stem guide and disc holder of the best steam brass, accurately machined.
3. Diaphragm, heavy B&B Multiflex Bellows of special composition brass.
4. Disc holder contains, renewable Jenkins disc.
5. Handle, index plate, hub pin and stop screw accurately machined and nickeled.
6. Swivel and nut extra heavy brass, nickeled finished.

All parts are interchangeable, and the trimmings of the valve full nickeled polished. This is a handsome and efficient Modulation Valve.

Roughing-in Dimensions



Size	A	B	C	D	E
½"	2⅞"	1 7/16"	4	¾"	1½"
¾"	3⅜"	1½"	4	1 "	1¾"
1 "	3¾"	1⅝"	4	1¼"	2 "
1¼"	4 "	2⅛"	4	1¼"	2¼"
1½"					

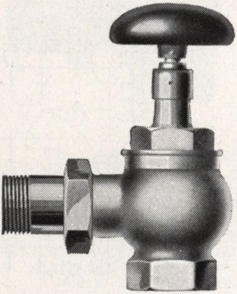
The Performance and capacity of the B&B Line of Modulation Valves on different service are as follows:

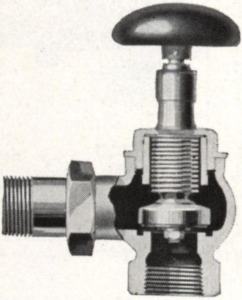
Size	Direct Radiation	
In.	Vacu Vapor	Return Line
½	0 to 20	0 to 25
¾	21- 60	26- 75
1	61-120	76-150
1¼	121-200	151-300
1½	201-350	301-500
2	351-450	501-650

The B&B Line of Multiflex Radiator Valves

Full Opening Type

The B&B Line of full opening valves is standard equipment for vapor, vacuum, one and two pipe steam, and for hot water installations. The valve is an all-metal packless type, durably constructed out of the best steam brass, fully nickeled and adjusted, and tested at the factory. The valve contains one Multiflex Bellows Diaphragm surrounding the valve stem. Steam, water and air-tight valve and without the use of gaskets, packing or stuffing boxes. Jenkins discs are used. This type furnished with wood handles, less than two turns of which opens full or closes tight the valve on its seat. All operating parts are not in direct contact with steam or water. The B&B Line of Full Opening Valves is a tried and proven one, hundreds of thousands of these valves being in use in all parts of the country.


Exterior


Interior

Sizes, patterns, serial numbers and weights of the B&B Line of Multiflex Full Opening Valves are as follows:

Size Inches	Pattern	Serial Number	Weight Lbs.
½	Angle	5415	2
½	S. W.	5505	2
½	R. H.	5515	2
½	L. H.	5525	2
¾	Angle	5185	2½
¾	S. W.	5535	2½
¾	R. H.	5545	2½
¾	L. H.	5555	2½
1	Angle	5425	3
1	S. W.	5565	3
1	R. H.	5575	3
1	L. H.	5585	3
1¼	Angle	5435	6
1¼	S. W.	5595	6
1¼	R. H.	5605	6
1¼	L. H.	5615	6
1½	Angle	5975	7
2	Angle	5985	10

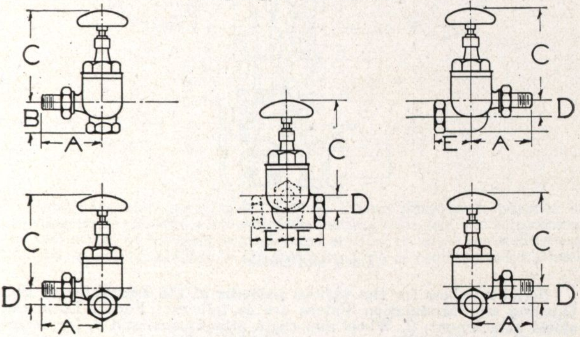
The B&B Line of Full Opening Valves

Specifications, Roughing-in and Performance Data

1. Body, bonnet of the best steam brass, fully nickeled.
2. Valve stem, valve stem guide and disc holder of best steam brass, accurately machined.
3. Diaphragm, heavy B&B Multiflex Bellows of special composition brass.
4. Valve, Jenkins disc, held in disc holder.
5. Handle, hub and pin accurately machined and fitted, finished black.
6. Swivel and nut, extra heavy, finished in nickel.
7. For pressures up to 25 pounds.

All parts interchangeable, the valve being factory tested and adjusted.

Roughing-in Dimensions



Size	A	B	C	D	E
½″	2⅞″	1 7/16″	4¾″	¾″	1½″
¾″	3⅜″	1½″	4¾″	1″	1¾″
1″	3¾″	1⅝″	4¾″	1¼″	2″
1¼″	4″	2⅛″	4¾″	1¼″	2¼″

The performance and capacity of the B&B Line of Full Opening Valves on the different heating systems on which it may be used are as follows:

Square Feet of Radiation

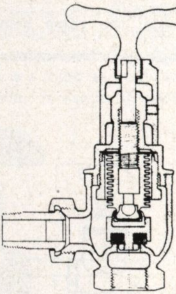
Size In.	Vacu Vapor	Return Line	One Pipe	Hot Water
½	0 to 20	0 to 25		
¾	21– 60	26– 75		0 to 21
1	61–121	76–150	0–30	21– 55
1¼	121–200	151–300	31– 60	56–150
1½	201–350	301–500	61– 80	151–225
2	351–450	501–650	81–130	226–

Made in the following patterns: Angle, straightway, right and left hand.

The B&B Line of Extended and Lock Shield Type of Valves

The B&B Line of Valves are furnished on orders specifying them with lock and shield, extension stem or with wheel and chain. These attachments may be applied to either the B&B Line of Full Opening Steam and Hot Water Valves, or to the B&B Line of Modulation Valves.

The lock and shield type is illustrated in the following cut.



Lock and Shield

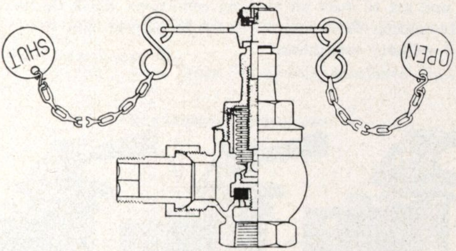
Serial numbers for the various patterns of the B&B Line of Full Opening and Modulation Valves are as follows: For 1, Lock and shield attachment; 2, Wheel and chain attachment, and 3, for extension stem type.

Size Inches	Pattern	No. 1 Lock and Shield	No. 2 Chain Pull	No. 3 Extension Stem Straight Handle
½	Angle	6375	7305	7345
½	S.W.	6805	7645	7525
½	R.H.	6815	7655	7535
½	L.H.	6825	7665	7545
¾	Angle	6385	7315	7355
¾	S.W.	6835	7675	7555
¾	R.H.	6845	7685	7565
¾	L.H.	6855	7695	7575
1	Angle	6395	7325	7365
1	S.W.	6865	7705	7585
1	R.H.	6875	7715	7595
1	L.H.	6885	7725	7605
1¼	Angle	6405	7335	7375
1¼	S.W.	6895	7735	7615
1¼	R.H.	6905	7745	7625
1¼	L.H.	6915	7755	7635
1½	Angle	6415		
2	Angle	6425		

The B&B Line of Extended and Lock Shield Type of Valves

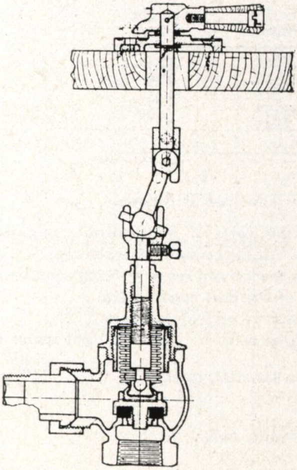
The wheel and chain type of stem fitting is illustrated in the following cut. This attachment permits of shutting off or turning-on of valves located at what would ordinarily be inaccessible places.

Chain Pull Type

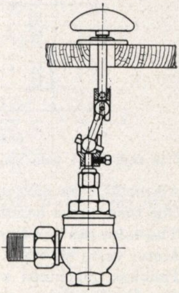


The extension stem type of stem fitting illustrated, permits of turning on or off concealed radiators, heating coils, etc. It is furnished in two styles of handles, straight and similar to those on modulation valves, or round, similar to the ordinary type of radiator valve wheel.

Straight Handle Type

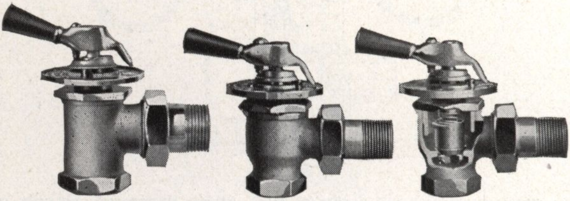


Wheel Handle Type



The B&B Line of Thermograde Modulation Valves

The B&B Thermograde Modulation Valve is a graduate, packless one-turn full open or closed, radiator supply valve. These valves are adapted to supply steam to radiators in connection with vapor, vacuum heating systems. There are no stuffing boxes to leak, and no repacking is required at any time, and this valve may be adjusted on the job and set to meet all working conditions. The B&B Thermograde Modulation Valve may be closed to its seat and thus be tight under all ordinary conditions.



The sizes, serial number and weights of this B&B Line are as follows:

Size Inches	Serial Number	Weight Lbs.
½	2505	1½
¾	2515	1½
1	2525	1¾
1¼	2535	2½
1½	2545	3

The merits of this valve are tabulated as follows:

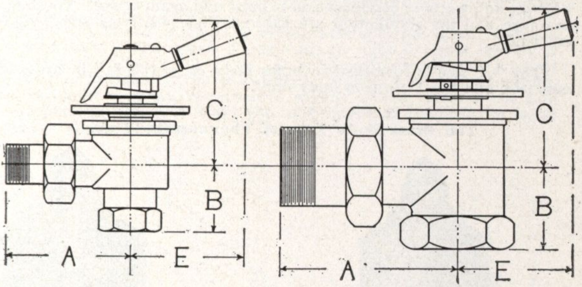
1. All-metal construction, moving parts of wear-resisting material.
2. One turn of the handle fully opens or shuts the valve.
3. The valve can be adjusted on the job and set to working conditions.
4. Metal valve on metal seat, of the best steam metal.
5. Packless, machined and fitted to perfect tightness.
6. Can be closed onto the seat, so as to be perfectly tight under all conditions.
7. Regulation, self indicating on the dial, to shut, ¼", ½", ¾" and full opening.
8. Parts interchangeable.
9. Has extra heavy swivel and nut, nickel finished.

The B&B Line of Thermograde Modulation Valves

Specifications, Roughing-in and Performance Data

1. Body, cap and dial, best steam brass, accurately machined and full nickel finish.
2. Indicator dial, etched metal, indicator handle, wood, highly polished, black.
3. Indicator screw, adjusting and lock screw, accurately machined and high finish.
4. Valve stem and locking device of the best steam brass, accurately machined.
5. All parts interchangeable.
6. Swivel and nut, solid brass, accurately machined, full nickel finish.

Roughing-in Dimensions



Size	A	B	C	E
½″	2 11/16″	1 7/16″	2 15/16″	2⅜″
¾″	3″	1⅜″	3″	2⅜″
* 1″	2 15/16″	1 9/16″	3 3/16″	2⅜″
* 1¼″	3 11/16″	1¾″	3¼″	2⅜″
* 1½″	4⅜″	2 3/16″	3⅞″	2⅜″

The performance and capacity of the B&B Thermograde Modulation Valve is, as follows:

Size Inches	Serial Number	Capacity	
		Sq. Ft. Vapor	Radiation Vacuum
½	2505	0–20	0–35
¾	2515	21–60	36–75
1	2525	61–120	76–150
1¼	2535	121–200	151–300
1½	2545	300	450

The B&B Line of Thermograde Auto Valves

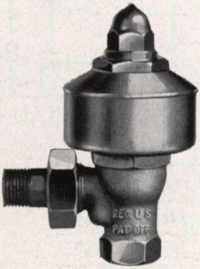
The B&B Line of Thermograde Auto Valves is a line of thermostatic return valves which allow the passage of air and water of condensation, automatically and noiselessly, without escape of steam, into the return piping.

It is used in connections with vapor and vacuum systems of steam circulation on the return ends of radiators, coils, drip points, and blast coils for draining without steam loss.

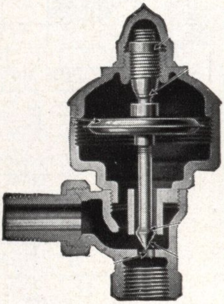
The Thermograde Auto Valve or Trap is supplied in three sizes ½″, ¾″ and 1″ and in two types of bodies, full brass and cast iron. All types are fitted with hand-spun phosphor bronze thermal members, accurately tested individually, and filled with a volatile liquid, hermetically sealed under twenty-two-inch vacuum. Steam in contact with the thermal member vaporizes the volatile liquid, in turn expands and closes the trap, preventing escape of steam; air and water of condensation cools the thermal member, and the trap opens, permitting both air and water of condensation to pass, and again closes. Thorough drainage and air elimination are assured with positively the highest efficiency.

The ½″ size is furnished in brass body only, the ¾″ in brass or cast iron and the 1″ in iron body only.

The Brass Body Type of Thermograde Traps



Exterior



Interior

The sizes, patterns, serial number and weights of the Brass Body Type are as follows:

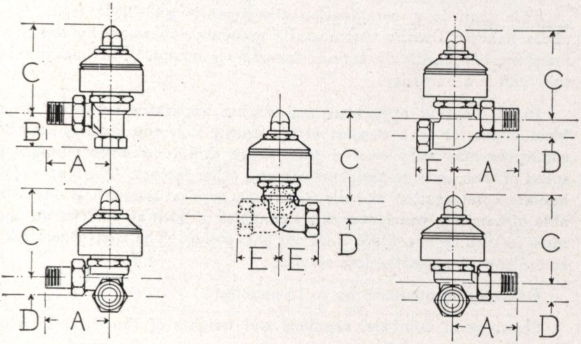
Size Inches	Type	Serial	Net Weight
½	Angle	2965	2
½	SW.	2975	2
½	Right	2985	2
½	Left	2995	2
¾	Angle	3005	3
¾	SW.	3015	3
¾	Right	3025	3
¾	Left	3035	3

The B&B Line of Thermograde Auto Valves Brass Body Type

Specifications, Roughing-in and Performance Data

1. Body, cover, pot and cover nut of steam brass, nickel finish.
2. Valve and seat, conical valve and sharp edge seat renewable.
3. Thermal member diaphragm of heavy hand spun phosphor bronze containing volatile liquid.
4. Valve stem, extra long, attached to thermal member on lower side.
5. Swivel and nut, solid brass, accurately machined, nickel finish.

This is an EXTERNAL adjusting trap, no disconnections of any kind are required to make any desired adjustments for full seating of valve on its seat, or to blow through for cleaning out. Steam does not have to be turned off to adjust, but as a very slight turning of the screw will have a pronounced effect, caution is indicated. Remove the cover nut, with a screw driver turn to right if closer seating is required, and to left if too close. It is advisable to do this without releasing lock washer if the adjustment required is small. If adjustment required is great, release lock washer, screw down when cold to full seating, then run down the lock washer. Replace the cover nut after any adjusting.



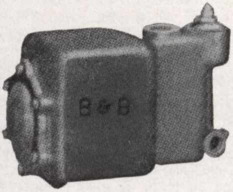
SIZE	A	B	C	D	E
½″	2⅝″	1 9/16″	3¾″	¾″	1¼″
¾″	3″	1⅝″	4⅛″	1″	1¼″

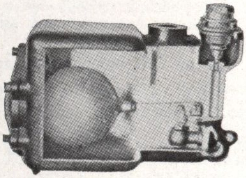
Performance: The B&B Line of Thermograde Auto Valves is external adjustment traps, and have the following capacities based on square feet of direct radiation.

Size	Vapor	Vacuum
½″	0 to 125	0 to 150
¾″	126 to 400	151 to 500

The B&B Line of Blast Traps

The B&B Blast Trap is used to handle large and variable quantities of condensation quickly and efficiently. It is of service in draining hot blast coils, dripping large mains, for draining hot water generators and similar apparatus. It can be used in connection with any return line vacuum system of steam circulation.





A combination of inlets and outlets is possible with this trap, but for standardized work the following is tabulated. In this tabulation special sizes of inlets are listed, which can be furnished if required.

This trap is a combination thermostatic and float trap. The air is handled by the thermostatic member, the water by the float member. It positively cannot become air bound. For heavy duty this trap is a necessity.

In all heating apparatus and drying apparatus subjected to a blast of air, or to a current of air drawn over the heating surface, conditions may vary over a wide range due to damper regulation, speed of fans, outside temperatures and other factors. The trap which handles condensation and air from such apparatus must be one capable of handling widely varying quantities of both air and water, and must in turn be one which does not pass steam. The B&B Blast Trap is designed for exactly this service.

Operates on pressures up to 15 pounds.

Sizes, serial numbers, tappings and weights of the B&B Line of Blast Traps are as follows:

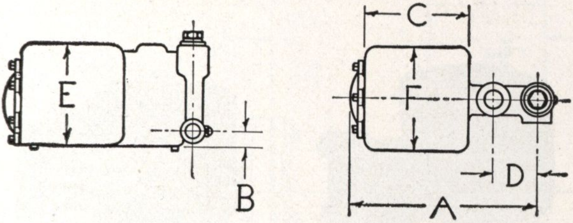
Trap No.	Serial No.	Inlet Reg.	Inlet Spec.	Outlet	Diameter of Valve	Weight Lbs.
1	2935	1	1¼	¾	½	60
2	2945	1¼	1½	1	⅝	60
3	2955	1½	2	1¼	⅝	65
4	4665	1½	2	1½	⅞	105
5	4675	2	2½	1½	1	105

The B&B Line of Blast Traps

Specifications, Roughing-in and Performance Data

1. Body and cover of fine grained cast iron. Cover fastened to body by six cap screws and asbestos graphited gasket used.
2. Valve, valve body, cover nut and link, of the best steam brass, especially selected for this service.
3. Float of seamless copper, tested at high pressure. Float connection, connection screw and extension interchangeable.
4. Air valve thermostatic element of the Multiflex bellows same design as used in the Multiflex Trap.

Roughing-in Dimensions



Size	A	B	C	D	E	F
1	13″	1½″	6¾″	3¼″	8½″	6¾″
2	14″	1½″	7¼″	3½″	8½″	6¾″
3	15″	1½″	7¾″	3¾″	8½″	6¾″
4	16″	1½″	9″	3¾″	8½″	9″
5	18″	1½″	10″	4″	8½″	10″

Performance: The B&B Line of Blast Traps has the following capacities:

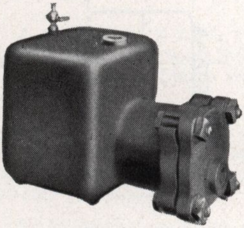
Trap No.	Capacity Sq. Ft. of Radiation	Lineal Feet of one inch pipe
1	3000	9000
2	6000	18000
3	9000	27000
4	12000	36000
5	15000	45000

The B&B Line of Low Pressure Traps

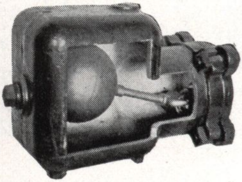
Coenco Type

The B&B Line of Low Pressure Traps are steam traps of the Coenco type for handling large quantities of water without the escape of steam The valve is of the piston type operated by a float. The valve opens when the water reaches a predetermined level, discharging air and water of condensation into the return. This trap assures against steam loss when condensation is not present. The trap operates on pressures up to 30 pounds and discharges against a head of water approximately 2 feet for each pound of pressure.

The valve opening is large, all working parts are attached to the head, and access to these parts is very easy.



Exterior



Interior

The B&B Line of Low Pressure Traps automatically and continuously drain all condensation from apparatus using steam up to 30 pounds pressure. Valve and seat are designed for low pressure work, assuring the trap to be continuous in its discharge. This trap will not discharge water back to a boiler. For pressure under 15 pounds the B&B Line of Multiflex Traps are recommended, in place of this type.

The sizes, serial numbers, tappings and weight of the B&B Line of Low Pressure Traps are as follows:

No.	Serial	Tappings Inches	Weight Lbs.
1	3825	¾x¾	45
2	3835	1 x1	53
3	3845	1¼x1¼	56
4	3855	1½x1½	86
5	3865	2 x2	103

The B&B Line of Low Pressure Traps

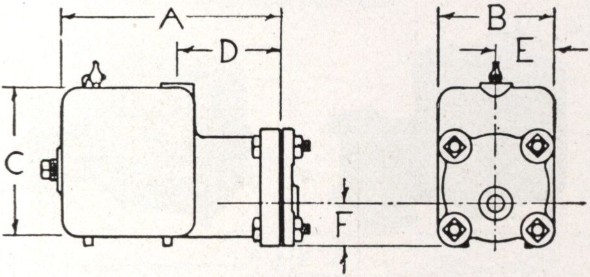
Coenco Type

Specifications, Roughing-in and Performance Data

1. Body and cover of heavy iron castings. Cover fastened to body by four suitable bolts.
2. Gasket, graphited asbestos.
3. Valve, piston type, securely fastened to float. Valve opening larger than inlet pipe.
4. Float ball, of seamless copper tested to high pressure.
5. Float lever securely fastened to ball and valve lifting arm.
6. Vent cock and clean-out plug provided.

The best steam brass is used in the valve proper, of a grade that we have found to be highly resistent to the cutting action of water.

Roughing-in Measurements



Size	A	B	C	D	E	F
1	12¼″	7″	9″	5¾″	3½″	2½″
2	13″	7″	9¾″	6″	3½″	2½″
3	14″	7″	10½″	6¼″	3½″	2½″
4	15⅛″	9¼″	11″	6½″	4⅝″	2⅝″
5	15⅞″	9¼″	11¾″	6¾″	4⅝″	2⅝″

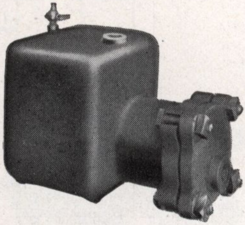
Performance: The attached tables figured from actual working tests indicate the use of the B&B Line of Low Pressure Traps.

Size	Inlet /Outlet Inches	Will Drain: Lineal Feet of 1″ Pipe	Square Feet of Radiating Surface
No. 1	¾	6480	2160
No. 2	1	10080	3360
No. 3	1¼	14400	4800
No. 4	1½	19800	6600
No. 5	2	25920	8640

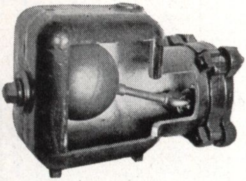
The B&B Line of High Pressure Steam Traps

Coenco Type

The B&B Line of Steam Traps for high pressure is of the Coenco type, the valve being of the Corliss type, operated by a seamless copper float. The float causes the valve to open when the water rises and cuts off the discharge when the water level falls to a predetermined point. It is a perfectly balanced valve and gives perfect satisfaction under all conditions, and is unaffected by wear. The float and valve are rigidly connected, lost motion is eliminated, and the valve cannot be thrown out of line with the seat. All working parts are attached to the head and can be removed with it.



Exterior



Interior

The B&B High Pressure Steam Trap, for pressures up to 100 pounds will lift condensation to a high level, there being 2 feet in height allowance for each pound difference of pressure between inlet and outlet. The ratings of this trap are based on actual test under working conditions, and proper provisions are made for the heavy condensation that takes place in some types of steam equipment when the steam is first turned on.

This trap will not discharge water back to the boiler.

The sizes, serial numbers, tappings and weight of the B&B Line of High Pressure Traps are as follows:

No.	Serial	Tappings Inches	Weight Lbs.
1	2385	¾x ¾	45
2	2735	1 x1	53
3	2745	1¼x1¼	56
4	4025	1½x1½	86
5	4035	2 x2	103

The B&B Line of High Pressure Traps

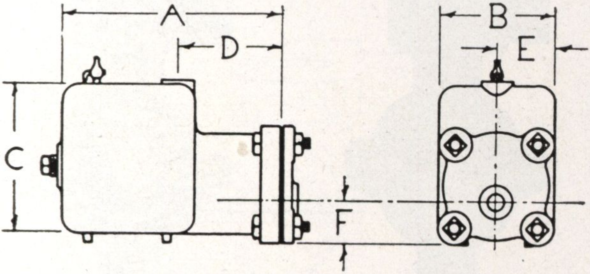
Specifications, Roughing-in and Performance Data

1. Body and cap of heavy iron castings. Cap fastened to body by four suitable bolts.
2. Gasket, graphited asbestos.
3. Valve body, key and yoke of the best steam brass, accurately fitted and tested at the factory. Attached to the head and removable with it. A Corliss Valve.
4. Float ball, of seamless copper tested to 150 pounds pressure.
5. Float lever securely fastened to ball and to valve actuating lever.
6. Vent cock and clean-out plug accurately fitted.

The composition used in the valve proper is extremely hard metal and will resist the cutting action of water many times longer than will ordinary steam metal.

The B&B High Pressure Trap will discharge 2 feet in height for every pound pressure under which it is operating, or against any lower pressure. It will not return the water of condensation to the boiler.

Roughing-in Dimensions



Size	A	B	C	D	E	F
1	12¼″	7″	9″	5¼″	3½″	2½″
2	13″	7″	9¼″	6″	3½″	2½″
3	14″	7″	10½″	6¼″	3½″	2½″
4	15⅛″	9¼″	11″	6½″	4⅝″	2⅝″
5	15⅞″	9¼″	11¾″	6¾″	4⅝″	2⅝″

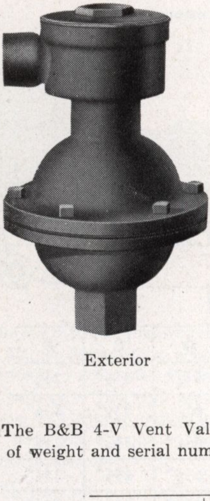
Performance: The attached table figured from actual working tests indicates the use of the B&B Line of High Pressure Traps.

Size	Inlet–Outlet Inches	Will Drain: Lineal Feet of 1" Pipe	Square Feet of Radiating Surface
1	¾	3000	1000
2	1	6500	2175
3	1¼	15000	5000
4	1½	20000	6675
5	2	30000	10000

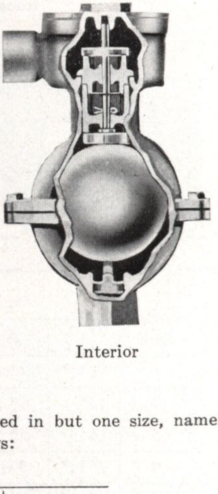
The B&B Line of 4-V Vent Valves

The B&B 4-V Vent Valve is a device designed to prevent a steam heating system from becoming air bound. It is for use in air line systems or in vacu-vapor systems.

It allows air to escape from a heating system and prevents its return, and is a quick venting device. Water of condensation accumulating in the valve, raises the float in the bottom half of the device, preventing the escape of water. It should be placed on the top of the dry return at its lowest point, but should never be installed at less than 30 inches above the water line of the boiler.



Exterior



Interior

The B&B 4-V Vent Valve is furnished in but one size, namely 1", of weight and serial number as follows:

Size Inches	Serial Number	Net Weight Lbs.
1	935	12½

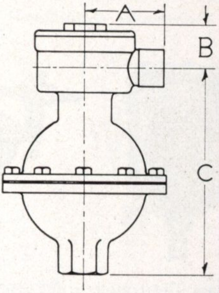
The 4-V Vent Valve is substantially made, the body of heavy iron casting, the air and water valve being solid bronze, the ball being of composition and unaffected by hot condensation. With this device no stand pipe or overflow commonly used on vapor systems is necessary.

The B&B Line of 4-V Vent Valves

Specifications, Roughing-in and Performance Data

1. Body, heavy fine grained grey cast iron.
2. Air and water valve accurately machined from solid selected bronze.
3. Valve seat, composition suitable for the service designed for.
4. Float ball of composition that is not affected by hot condensation.
5. The valve contains no complicated parts, and requires no attention after installing, adjusting being made at the factory.

Roughing-in Dimensions



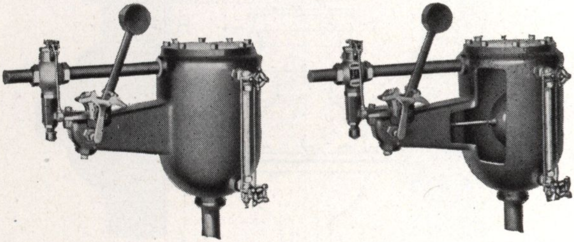
Size	A	B	C
1″	3⅜″	1⅝″	8½″

Performance: The B&B 4-V Vent Valve is used in connection with vapor systems not exceeding 2500 square feet of direct radiation. Piping arrangements sometimes require two or more vent valves. It is also used on air line systems not exceeding 800 square feet of direct radiation. On systems having a vacuum pump, it may be used for the purpose of relieving air from the systems when the vacuum pump is shut down and the by-pass open to the boiler.

The B&B Line of Alternating Receivers

The B&B Alternating Receiver is a device which automatically returns water to the boiler. They are for use on vapor system of steam circulation. On such installations the returns are open to atmospheric pressure, and when pressures build up on the supply side, condensation backs up in the return line until a head is formed sufficient to overcome boiler pressure. Because of this occurrence, air binding is common, and to overcome this defect the B&B Alternating Receiver has been designed.

The condensation rises in the receiver until the discharge lever is reached, the float rises and opens valve, and the pressure between receiver and boiler is equalized and the water returns to the boiler. The B&B Alternating Receiver should be installed above the water line of the boiler and never less than six inches above. Condensation will not collect in return mains regardless of boiler pressure, be it 2 pounds or 10, when a B&B Alternating Receiver is used.



Note: The Gauge Glass Illustrated is not considered standard equipment; if wanted must be specified extra.

The sizes, serial numbers and weights of the B&B Line of Alternating Receivers are as follows:

Size	Serial No.	Size	Steam Connections Inches	Weight Lbs.
No. 1	3065		1	180
No. 2	5125	20″x24″	1	270
No. 3	5405	24″x30″	1½	
No. 4	5655	24″x36″	1½	

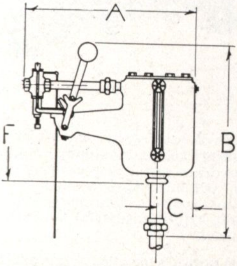
The B&B Alternating Receiver requires no additional head room for its installation. It is simple, fool proof, positive and noiseless in operation.

The B&B Line of Alternating Receivers

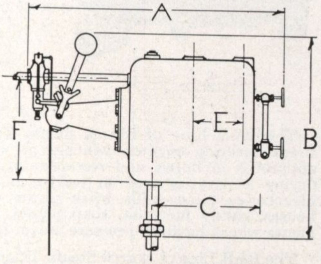
Specifications, Roughing-in and Performance Data

1. Body of best fine grained grey cast iron for sizes 1 and 2, accurately machined.
2. Body of steel plate accurately rolled with all joints welded. For Nos. 3 and 4.
3. Cover of fine grained grey cast iron accurately machined.
4. Seamless copper float securely fastened to trip lever arms.
5. Actuating lever with weight and trip pins cast in one piece, from grey cast iron.
6. Operating levers of the best brass, accurately machined and fitted.
7. Equalizing valve of the best steam brass, accurately machined, fitted and adjusted.
8. Valve seat, stem and valve proper of the best steam brass accurately machined.
9. Entire assembly thoroughly inspected and factory tested.
10. Gauge glass ½″, 10 inches on sizes 1 and 2, 6″ on larger sizes, of standard quality as required by the B&B Line.
11. Screws, gaskets, stuffing boxes to the high standard of quality required by the B&B Line.

Roughing-in Dimensions



No. 1



Nos. 2, 3 and 4

Size	A	B	C	E	F
No. 1	27″	23″	5½″	----	15¾″
No. 2	34″	26″	11½″	9″	19¼″
No. 3	40″	28″	21½″	7″	21½″
No. 4	49″	29″	27½″	11″	22 ″

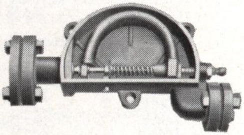
Performance: The B&B Alternating Receiver when connected to return mains as shown in typical drawings, will return all the water of condensation to the boiler without a pump, and effectively prevent air binding of low pressure vapor systems of steam heating. The capacity of the several sizes, based on square feet of direct radiation, is as follows:

Number	1	2	3	4
Capacity	6000	10000	15000	18000

The B&B Line of Marck Steam Traps

The B&B Line of Marck Steam Traps is for use on medium steam pressures, to automatically permit the passage of air and condensation, and to prevent passage of steam. It is an automatic valve, working on the thermostatic principal, does not exert force of any kind and will not return water to a boiler. It is always closed at temperatures above 212 and always open at below 212 degrees Fahrenheit. It is a valve that closes against the pressure. Air, water and dirt are blown through the trap by the pressure of the steam behind them, but as soon as steam reaches the trap, the tube spring acts by expanding and closes the valve. All parts of the Marck Steam Traps are interchangeable, 3 nuts permit access to the interior. As action takes place through temperature of the tube, the trap should not be installed directly over live steam pipes, boilers, etc., for in such cases the trap will not open.

Exterior



Interior

The B&B Line of Marck Steam Traps is used to drain whistles, sirens, steering engines, winches on vessels; to drain steam cooking apparatus in hotels and restaurants; to drain numerous heating and drying apparatus used in textile mills, cotton mills, woolen mills, bleacheries, paper mills, brick plants, lumber driers, laundries, greenhouses, candy factories, soap plants, and other industrial establishments where medium pressure steam is used.

The B&B Line of Marck Steam Traps is notable because of simplicity of construction and efficiency in operation, ease of access for cleaning, interchangeability of parts, large capacity and extra large valve openings. The capacity of this type of trap is equal to the capacity of the smallest pipe leading to or from it, hence this should be remembered in selecting size desired. A trap of this type blowing condensation continuously indicates a too small size. It is better as a rule to have a trap a little larger than necessary rather than one that is too small. It operates on pressure up to 50 pounds.

Sizes, serial numbers and weights of the B&B Line of Marck Steam Traps are as follows:

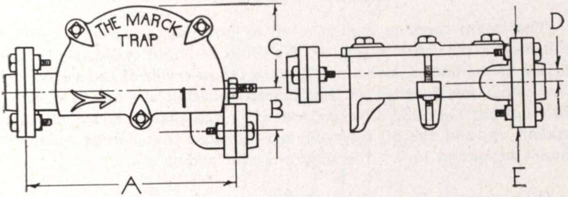
Size and Number In.	Serial No.	Weight Lbs.
¼ No. 00	1925	
⅜ No. 0	1935	6⅛
½ No. 1	1945	11
¾ No. 2	1955	13⅛
1 No. 3	1965	20
1¼ No. 4	1975	21⅛

The B&B Line of Marck Steam Traps

Specification, Roughing-in and Performance Data

1. Case and cover, selected cast iron, cover bolted on with 3 clips as illustrated.
2. Tube spring shown of selected material, hollow, bent crescent shape, and capable of standing high pressure, filled with liquid which at 212 degrees expands and closes the valve.
3. Valve seat made of composition selected for wearing qualities.
4. Valve stem guide supports and guides valve.
5. Brass spring holds the tube in position against the adjusting spring and prevents expansion in any other direction than against seat. This spring has no effect on the valve opening, which is controlled by tube spring.
6. Adjusting screw moves tube spring forward or back as may be required to properly seat the valve.

Roughing-in Dimensions



Size	A	B	C	D	E
0—⅜″	6⅝″	1¼″	2⅞″	½″	3⅜″
1—½″	8¾″	1¾″	3½″	½″	3⅝″
2—¾″	10⅝″	1¾″	4″	½″	3⅞″
3—1″	13″	2″	5″	½″	4″
4—1¼″	14¼″	2″	5″	½″	4⅜″

This trap will not discharge against pressure, hence must be placed at the lowest point to be drained. It can be placed vertically, horizontally or flat, but the curve of the body MUST NEVER BE DOWN, as condensation would pocket in this position. Connections should be made to INLET, the arrow on the case shows direction of flow.

Capacities in Square Feet of 1″ Pipe

Size and Number In.	Size of Pipe Connection Inches	Capacity in Sq. Ft. of 1″ Pipe
⅜ No. 0	⅜	225 to 900
½ No. 1	½	450 to 2,700
¾ No. 2	¾	900 to 5,850
1 No. 3	1	1,800 to 6,750
1¼ No. 4	1¼	2,250 to 10,800

The B&B Line of Separators

The B&B Oil & Steam Separators

The B&B Line of Steam Separators separates the moisture and slugs of water from live steam, insuring higher efficiency in engine and high pressure heating apparatus.

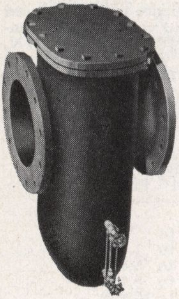
They are designed for service where it is desirable or necessary to remove any liquid or solid substances, such as water, oil, grit, dirt and scale, from any gaseous currents or steam.

The B&B Line of Oil and Steam Separators is made in sizes from 2″ to 12″, and for use on gravity or vacuum systems of heating.

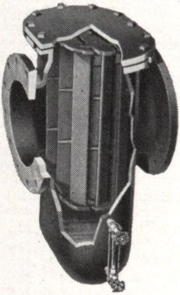
The steam carrying moisture, oil or dirt passes through a series of baffles in the B&B Separator, the drops of liquid collecting on the surface of the baffles, and dropping into the reservoir of the separator. The baffles are designed so that liquids collected are not in contact with flowing GASES, after collection by the plates, hence are not retaken up, and the oil reservoir is so located that liquids collected cannot be picked up by the steam current again.

Oil separators in particular will tend to collect dirt, in fact any separator on steam, air or other gas will collect more or less oil, hence dirt, and thus baffles will become dirty. The baffle plates are easily removable for cleaning without disturbing pipe connections, the top cap of the separator being easily taken off. Oil Separators should be dripped through a B&B Oil Trap. Steam Separators should be dripped through a B&B High Pressure Steam Trap.

Standard equipment does not include companion flanges or gauge glass, and if desired, they must be specified.



Exterior



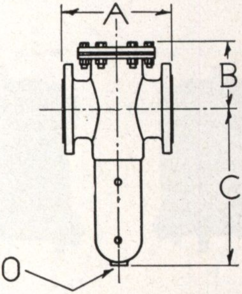
Interior

The B&B Line of Oil and Steam Separators

Specifications, Roughing-in and Performance Data

1. Body and cover made of fine grained grey cast iron, accurately machined.
2. Baffle plates of special grey cast iron, V-shaped and packed to impinge, but not obstruct flow. Impingement of solids and liquids retains them.
3. Bolts, plugs and gaskets to the high standard of quality required by the B&B Line.
4. Companion flanges furnished when specified only. Flanges of separators drilled to standard bolt circles.
5. Gauge glass furnished when specified. As standard gauge glass connections, drilled and tapped, and properly plugged.
6. Pipe tap connection on bottom of separator drilled and tapped, for connection to the proper type of trap.

Roughing-in Dimensions



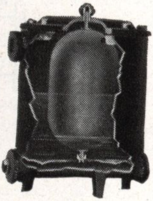
Size Inlet & Outlet	Serial No.	A Inches	B Inches	C Inches	O Inches	Weight Lbs.
2	4105	7¾	11	11¼	¾	49
3	4115	10	12	14¾	¾	87
4	2435	12	14	17¼	¾	146
5	4095	12	18	16½	¾	156
6	4185	13½	19½	17¾	¾	170
8	4135	16½	24¼	19	¾	221
10	3425	17½	25½	22½	¾	440
12	3565	18	33½	25	1¼	500

Performance: The B&B Line of Oil and Steam Separators will remove oil and moisture contained in steam, air or other gas or vapor passing through a pipe line in which they are installed efficiently and completely. The moisture content in steam use will be reduced to approximately 1½% after passing through these separators. Dry, oil free steam results, to the limits of mechanical separation. For steam separation the B&B Line of Separators are designed for a steam working pressure of 125 pounds or lower. For extra heavy purposes. these separators are furnished in special designs to meet such conditions, but to similar patterns.

The B&B Line of Oil Traps

The B&B Oil Trap is used for draining oil separators and exhaust steam mains. The Oil Trap is equipped with a seamless copper float so arranged as to open and close the valve direct, without the use of pivots, levers, or other actuating mechanism. The operation is extremely simple and performance positive. Under suitable and favorable conditions this B&B Oil Trap may be used as a Low Pressure Steam Trap.

Two outlet tappings are provided, either one of which may be used for connection and the unused one plugged. The entire interior can be exposed by removing the cover, and without disturbing pipe connections.



The B&B Oil Trap is offered in one size only, tapped to ¾″ inlet and outlet. The body is large, yielding ample clearance for the float, the float being guided so that it cannot jam. The valve closes smoothly.

When installed the B&B Oil Trap should be provided with a bypass, and never placed less than 2 feet below the point to be drained. When this trap is used to drain vacuum equipment, a tight swing check valve must be placed on the discharge side of the trap, to prevent entrance of air, at such times as the pressure in low pressure mains is below atmospheric.

The size, serial number and weight of the B&B Line of Oil Traps is as follows:

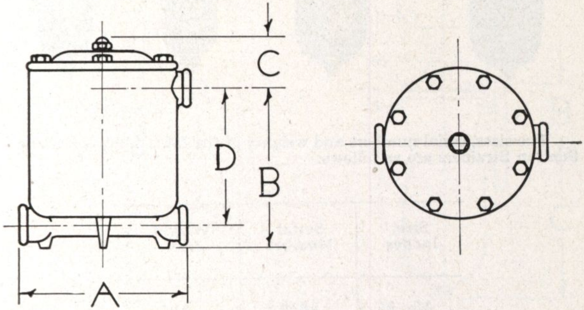
Size	Serial Number	Net Weight
¾″	3555	40

The B&B Line of Oil Traps

Specifications, Roughing-in and Performance Data

1. Body, cover and cap, fine grained grey iron castings, accurately machined.
2. Seamless copper float, valve plunger and guide securely fastened to float.
3. Valve seat selected brass, resistant to action of oil, grease and water.
4. Pins, screws and gaskets to B&B high standard of quality.

Roughing-in Dimensions



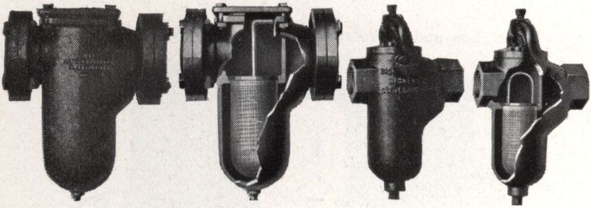
Size	A	B	C	D
¾″	9	8⅞	2¾	7½

Pipe Size, ¾″. Allow Head-space of 6″ at C for Cleanout.

Performance:—The use of the B&B Oil Trap is of ample capacity to handle all the drainings from any of the B&B Line of Separators.

The B&B Line of Dirt and Suction Strainers

Strainers are an important power plant or heating plant consideration, for all fittings no matter how skillfully installed, and especially true of such articles as cast iron radiators, contain sand and dirt in them that may take a long time to work out. Dirt, chips and bits of packing will get into even the best of regulated and operated steam plants, and such materials will cause trouble at various points if not removed. The B&B Line of Suction Strainers are used in steam lines in front of traps, or any automatic device to prevent all foreign matter from entering such devices. On vacuum return lines they are used just ahead of the vacuum pump. They assure of positive continuous service on all apparatus using steam, air or gas, by eliminating trouble makers in the form of dirt and scale.



The sizes, serial numbers and weights of the B&B Line of Dirt and Suction Strainers are as follows:

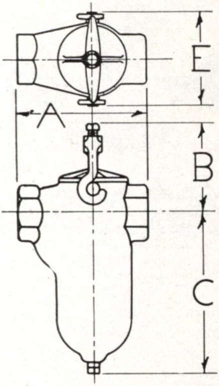
Size Inches	Serial Number	Weight Lbs.
¾x ¾	4829	4¼
1 x ½	4619A	4¼
1 x ¾	4619B	4¼
1 x1	4619	4¼
2 x1¼	4629A	16½
2 x1½	4629B	16½
2 x2	4629	16½
3	4809	43
4	4849	110
5	4909	130
6	4919	170

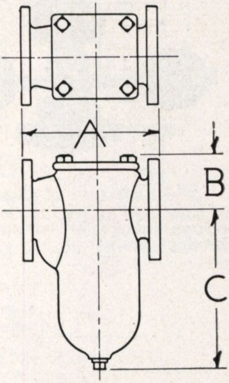
The B&B Line of Dirt and Suction Strainers

Specifications, Roughing-in and Performance Data

1. Body and cover fine grained grey cast iron, accurately machined
2. Yoke and hook on sizes ¾″, 1″ and 2″ fine grained cast iron accurately machined.
3. Adjusting screw, bolts and gaskets to the high standard of quality required by the B&B Line.
4. Sizes ¾″, 1″ and 2″ a round body, with round cover. Sizes 3″ and 4″ a round body but with a square cover.
5. Strainer collar, high quality brass, accurately machined and fitted in each strainer.
6. Cover removable on the ¾″, 1″ and 2″ sizes by loosening ONE screw, on the 3″ and 4″ sizes by loosening four cover bolts.
7. Strainer cylinder provided with 1/64″ perforations, and suitable for service on steam, gas or air.
8. Sizes ¾″, 1″ and 2″, for standard screwed connection, 3″ and 4″ for flange connection, companion flanges not being considered as standard equipment.
9. For liquid service, perforations are supplied 1/32″, all strainers being provided with a convenient handle to remove the gasket when required.

Roughing-in Dimensions

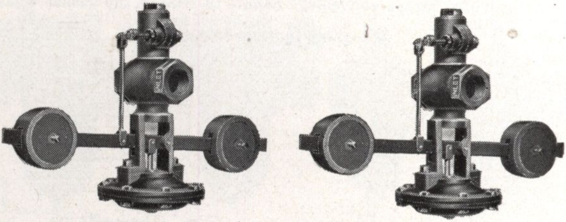




Size Inches	A Inches	B Inches	C Inches	E Inches
¾ x ¾	4⅝	3 1/16	5 3/16	3 5/16
1 x ½	4¾	3 1/16	5¼	3 5/16
1 x ¾	4¾	3 1/16	5¼	3 5/16
1 x1	4¾	3 1/16	5¼	3 5/16
2 x1¼	7¼	4⅞	8¾	5¼
2 x1½	7¼	4⅞	8¾	5¼
2 x2	7¼	4⅞	8¾	5¼
3	10⅜	3⅞	11⅝	7½
4	14½	4⅛	14⅞	9
5	16½	5	15½	10
6	16½	5	15½	10

The B&B Line of Pressure Regulating Valves, Class A

The B&B Line of Class A Pressure Regulating Valves is suitable for reducing from initial pressure of 100 pounds down to any pressure on the reduced side to 5 pounds. For accurate work, and where the initial pressure exceeds 100 pounds, two valves should be installed, making first reduction to 50 pounds, and from 50 pounds down to pressure required. The B&B Line of Class A Pressure Regulating Valves reduce and maintain an even pressure of steam regardless of the variation of the initial pressure, or of the volume of steam required. They automatically reduce boiler pressure for steam heating systems of all kinds, including vacuum systems, and are of industrial service for reducing pressures in central heating plants, to engines, paper making machines, dye kettles, textile machinery such as slashers, etc.



The B&B Line of Class A Pressure Regulating Valves is made in sizes from ½″ to 1½″ inclusive, and will close tight on a variation of pressure of only four ounces, making this valve of great service in heating installations.

Size Inches	Serial Num.	Weight Lbs.
½x ½	3685	27
¾x ¾	3695	27
1 x1	3705	27
1 ¼x1 ¼	3715	33
1 ½x1 ½	3725	33

The operating pressure is transmitted to diaphragm from the low pressure side, through a half-inch pipe, which should be connected to low pressure main at least 15 feet from the valve. The diaphragm and all working parts are accessible without disturbing the pipe connections. These valves are threaded at both ends with standard right-hand pipe threads.

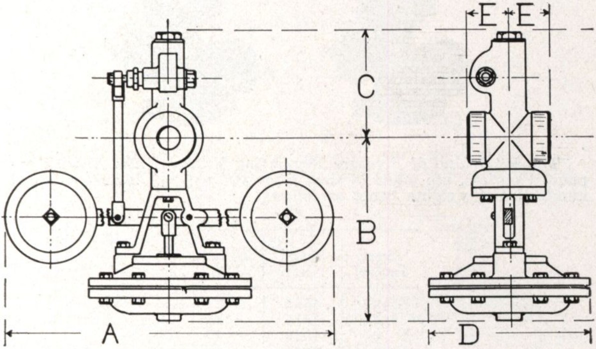
When it is necessary to connect the governing pipe close to the valve the use of a B&B Accumulator is recommended, and in specifying it is desirable to indicate the pressures at which the valve will be operated.

The B&B Line of Pressure Regulating Valves Class A

Specifications, Roughing-in and Performance Data

1. Body and bracket of fine grained cast iron, accurately machined.
2. Valves of wear-resisting selected bronze perfectly balanced. Piston type, 3 discs.
3. Links, levers and shaft of medium open hearth steel, accurately machined.
4. Brass caps, stuffing box nuts, valve bushings of steam brass accurately machined.
5. Screws nuts, bolts and set screws to high standards of quality required by the B&B Line.
6. Diaphragm, selected specially manufactured rubber composition to the B&B standard.

Roughing-in Measurements



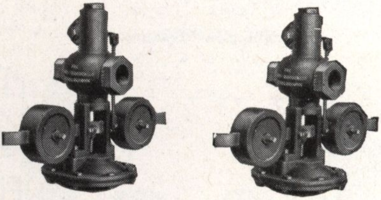
Serial No.	3685	3695	3705	3715	3725
Pipe Size	½″	¾″	1″	1¼″	1½″
A	28½″	28½″	28½″	28½″	28½″
B	8 17/32″	8 17/32″	8 17/32″	9 19/32″	9 19/32″
C	4 15/16″	4 15/16″	4 15/16″	5 11/16″	5 11/16″
D	7¾″	7¾″	7¾″	7¾″	7¾″
E	1 15/16″	1 15/16″	1 15/16″	3″	3″

Performance: These valves are so accurately balanced that they will open or close tightly on a variation of pressure of four ounces.

The B&B Line of Pressure Regulating Valves, Class A, With Expanded Outlet

The B&B Line of Expanded Outlet, Class A, Pressure Regulating valves are made in sizes from ½-inch to 1½ inches, and are used for reducing steam. For accurate work where the initial pressure exceeds 100 pounds and pressures lower than 50 pounds are required, two valves should be installed in series. These valves automatically reduce boiler pressure for steam heating service of all kinds, and is suitable for installation in hotels, apartment houses, office buildings or in manufacturing plants.

The valve is perfectly balanced and will open wide or close tight with a variation of only 4 ounces of pressure. The valve is of the piston type, provided with a third disc which counter-balances the valve in all positions.



The B&B Line of Pressure Regulating Valves, Class A, with expanded outlets, are made in sizes from ½″ to 1½″ inclusive, serial numbers and weights being as follows:

Size Inches	Serial Num.	Weight Lbs.
½x1	4625	27
¾x1½	4615	33
1 x2	4635	40
1¼x2½	4645	45
1½x3	4655	50

The operating pressure is transmitted to the diaphragm from low pressure side through a half-inch pipe, which should be connected to low pressure main at least 15 feet from the valve. The diaphragm and all working parts are accessible without disturbing the pipe connections. These valves are threaded at both ends with standard right-hand pipe threads.

When it is necessary to connect the governing pipe close to the valve, the use of a B&B Accumulator is recommended. In all cases a stop valve should be inserted in the governing pipe. An accumulator will naturally protect the diaphragm from contact with steam, and it is an advisable installation.

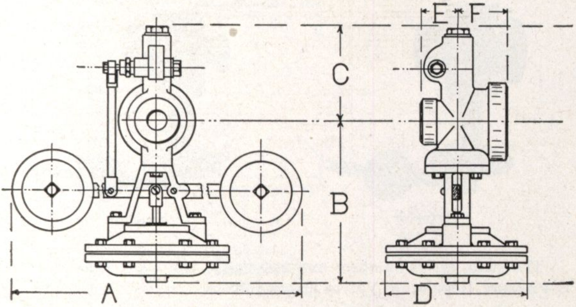
Pressure regulating valves small enough to work nearly wide open should be selected. When a valve of generous size is used, and with valves accordingly too large for the work, they will only partly open, and while the B&B Line of Class A Pressure Regulating Valves are equipped with valves made from the best steam brass, wire drawing in partly open valves will occur.

The B&B Line of Pressure Regulating Valves, Class A, With Expanded Outlet

Specifications, Roughing-in and Performance Data

1. Body and bracket of fine grained cast iron, accurately machined.
2. Valves of wear-resisting selected bronze, perfectly balanced, piston type, 3 discs.
3. Links, levers and shaft of medium open hearth steel, accurately machined.
4. Brass caps, stuffing box nuts, valve bushings of the best steam brass.
5. Screws, nuts bolts and set screws to the high standard of quality required by the B&B Line.
6. Diaphragm, selected specially manufactured rubber composition, to the B&B standard.
7. Diaphragm washers and nut of best brass, accurately machined.

Roughing-in Measurements



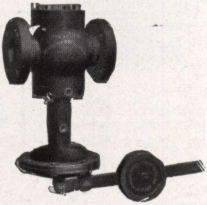
Serial No.	4625	4615	4635	4645	4655
Inlet Pipe	½″	¾″	1″	1¼″	1½″
Outlet Pipe	1″	1½″	2″	2½″	3″
A	28½″	28½″	28½″	28½″	28½″
B	8$\frac{17}{32}$″	8$\frac{17}{32}$″	8$\frac{17}{32}$″	9$\frac{19}{32}$″	9$\frac{19}{32}$″
C	4$\frac{15}{16}$″	4$\frac{15}{16}$″	4$\frac{15}{16}$″	5$\frac{11}{16}$″	5$\frac{11}{16}$″
E	1$\frac{15}{16}$″	1$\frac{15}{16}$″	1$\frac{15}{16}$″	3″	3″
F	1$\frac{15}{16}$″	2½″	2½″	3″	3″

Performance: These valves are so balanced that they will open or close tightly on a variation of pressure of four ounces.

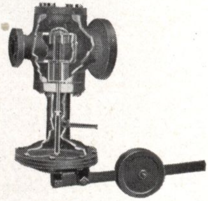
The B&B Line of Pressure Regulating Valves, Class B

The B&B Line of Pressure Regulating Valves, Class B, is for use with medium initial pressures, not in excess of 100 pounds per square inch, and reducing to any desired pressure. The valve is offered in sizes from 2″ to 12″ for flange connections. Companion flanges are not considered as standard equipment, and must be specified if desired. This B&B Line is of special service and utility on heating systems.

For accurate work where initial pressure of 100 pounds and reduced pressure is less than 50 pounds, the use of two valves is recommended, making the first reduction from 100 to 50 pounds, and the final one from 50 to the service pressure. This valve is of the piston type, guided independently of the spindle or diaphragm and furnished with extra counter balanced disc, a feature that prevents surging.



Exterior



Interior

The sizes, serial numbers and weights of the B&B Line of Class B Pressure Regulating Valves are as follows:

Size Inches	Serial Number	Weight Lbs.
2	3585	95
2½	3595	110
3	3605	120
4	3615	138
5	3625	264
6	3635	310
8	3655	410
10	3665	540
12	3675	680

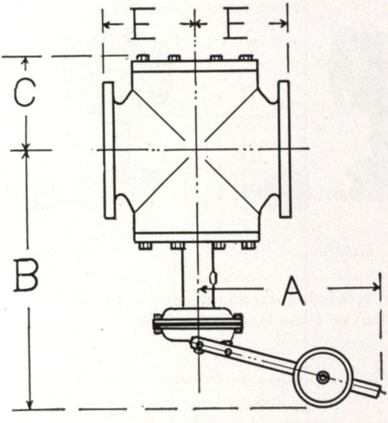
The B&B Class B Pressure Regulating Valve is controlled by means of a governing pipe, connecting the diaphragm chamber to the point on the heating main at which a steady pressure is to be maintained. The lever and weight may may be placed in any position convenient so as to avoid obstructions.

The B&B Line of Pressure Regulating Valves, Class B

Specifications, Roughing-in and Performance Data

1. Body, cover and upper and lower diaphragm casings of fine grained grey cast iron accurately machined.
2. Valve, valve stem, and valve stem collar of special wear-resisting bronze, accurately machined. Valve of the balanced, piston type.
3. Lever and fork of medium open hearth steel, accurately machined, lever equipped with cast iron counter weight of proper dimensions with set screw.
4. Water sealing tube of selected brass tubing, accurately fitted.
5. Taper pins, studs, cap screws, lever bolts and cover gaskets to the high standard of quality required by the B&B Line.
6. Diaphragm selected specially manufactured rubber composition to the B&B standard.

Roughing-in Measurements



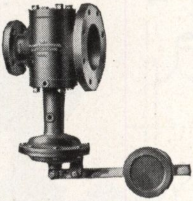
Serial No.	3585	3595	3605	3615	3625	3635	3655	3665
Pipe Size	Inches 2	Inches 2½	Inches 3	Inches 4	Inches 5	Inches 6	Inches 8	Inches 10
A	29¼	29¼	29¼	29¼	29¼	29¼	29¼	29¼
B	28 7/16	29 5/16	29⅝	30⅞	31 5/16	32 3/16	34 3/16	36⅝
C	4	4 13/16	5⅛	5⅜	7	7 11/16	9⅞	10 9/16
E	4⅝	5½	5½	6⅛	7 3/16	7⅜	9¼	10½
F	4⅝	5½	5½	6⅛	7 3/16	7⅜	9¼	10½

Performance: In selecting reducing valves it is advisable to use care to select sizes that will have low velocities, thus avoiding a whistle or a howl. Flanges on these valves are faced and drilled to standard templates unless otherwise specified.

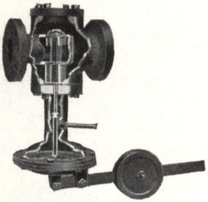
The B&B Line of Pressure Regulating Valves, Class B, With Expanded Outlet

The B&B Line of Pressure Regulating Valves, Class B, is for use with medium initial pressures, not in excess of 100 pounds per square inch, and reducing to any desired pressure. The valve is offered in sizes from 2″ to 12″ for flange connection. Companion flanges are not considered as standard equipment and must be specified if required. This valve is of special service and utility on heating systems.

For accurate work where initial pressure is 100 pounds, two valves should be installed, making first reduction to 50 pounds and from there on to the final pressure. The valve is of the piston type, guided independently of the spindle or diaphragm and furnished with extra counter balanced disc, a feature that prevents surging.



Exterior



Interior

The sizes, serial numbers and weights of the B&B Line of Pressure Regulating Valves, Class B, are as follows:

Size Inches	Serial Number	Weight Lbs.
2 x 4	4895	97
2½x 5	4905	125
3 x 6	4915	135
4 x 8	4925	350
5 x10	4935	160
6 x12	4945	300

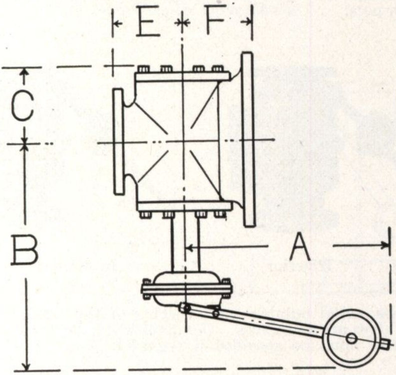
The B&B Line of Class B, Pressure Regulating Valve is controlled by means of a governing pipe connecting the diaphragm chamber to the point on the heating main at which a steady pressure is to be maintained. The lever and weight may be placed in any position convenient and so as to avoid obstructions.

The B&B Line of Pressure Regulating Valves, Class B

Specifications, Roughing-in and Performance Data

1. Body, cover and upper and lower diaphragm casings of fine grained grey cast iron, accurately machined.
2. Valve, valve stem and valve stem collar of special wear-resisting bronze, accurately machined. Valve of balanced piston type.
3. Lever and fork of medium open hearth steel, accurately machined, lever equipped with cast iron counter weight of proper dimensions with set screw.
4. Water sealing tube of selected brass tubing, accurately fitted.
5. Taper pins, studs, cap screws, lever bolts and cover gaskets to the high standard of quality required by the B&B Line.
6 Diaphragm, selected specially manufactured rubber composition to the B&B standard.

Roughing-in Measurements



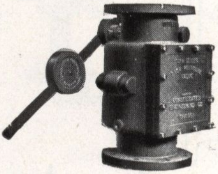
Serial No.	4895	4905	4915	4925	4935	4945
Inlet Pipe..	2	2½	3	4	5	6
Outlet Pipe	4	5	6	8	10	12
A.........	29¼	29¼	29¼	29¼	29¼	29¼
B.........	28 7/16	29 5/16	29⅝	30⅞	31 5/16	32
C.........	4	4 13/16	5⅛	5⅜	7	7 11/16
E.........	4⅝	5½	5½	6⅛	7 3/16	7⅜
F.........	4⅝	5½	5½	6⅛	7 3/16	7⅜

Performance: In selecting reducing valves it is advisable to use care to select sizes that will have low velocities, thus avoiding a whistle or a howl. Flanges on these valves are faced and drilled to standard templates unless otherwise specified.

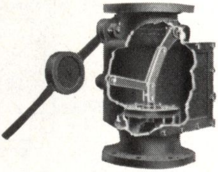
The B&B Line of Back Pressure Valves

The B&B Line of Back Pressure Valves will open or close with a variation of only two ounces pressure. They are accordingly desirable for use as a relief valve for condensing engines, or as back pressure valves for non-condensing engines. When used as atmospheric exhaust relief valves they will remain closed while a vacuum is in the condenser, but should the vacuum be lost the valves open. Used on the exhaust line of non-condensing engines they maintain a given back pressure of steam for use in heating, drying, cooking, and other similar industrial uses of low pressure steam. The B&B Line of Back Pressure Valves is sensitive, reliable and noiseless in operation. On a condensing engine they may be used as an atmospheric relief during summer months, and as a back pressure valve in winter to furnish exhaust steam for heating purposes.

By means of the toothed clutch for the lever, the valve may be operated in a vertical, horizontal or inclined position. The weight levers may be reversed to hold the valve wide open if desired, the free area of the valve being greater than the exhaust pipe. Pulsations of exhaust steam cannot injure this valve; the composition valve disc closes tightly and will not wire-draw. The weight lever and connecting links are designed to prevent damage by pulsation and without the use of dash pots.



Exterior



Interior

The sizes, serial numbers and weights of the B&B Line of Back Pressure Valves are as follows. Companion flanges are not considered standard and must be specified if required.

Size Inches	Serial Num.	Weight Lbs.
1½	2755	42
2	2765	48
2½	2775	66
3	2785	75
4	2795	109
5	2805	193
6	2815	193
8	2835	298
10	2855	520
12	2865	595

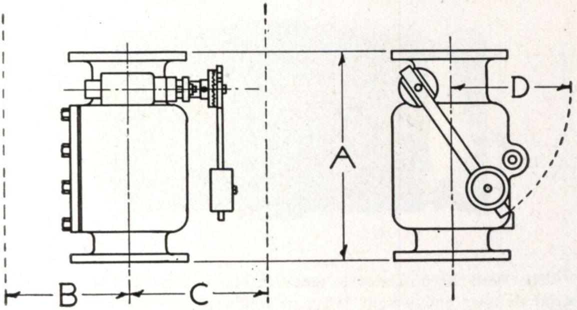
In specifying these valves, service, back pressure to be carried, for condensing or non-condensing engine connection, for back pressure or relief, and whether companion flanges are wanted should be stated.

The B&B Line of Back Pressure Valves

Specification, Roughing-in and Performance Data

1. Body and cover of fine grained grey cast iron, accurately machined
2. Valve disc, ring and cover of the best steam brass and selected composition.
3. Crank and crank shaft of medium open hearth steel, casting accurately machined, shaft accurately machined and keyed together.
4. Clutch hub and clutch top and cap, fine grained cast iron accurately machined and fitted.
5. Counter balance weight of grey cast iron mounted on weight lever of medium open hearth steel, being movable and with set screw to lock in desired position.
6. Pins and rollers in valve mechanism heat treated tool steel, finished smoothly
7. Gaskets, bolts, cap screws; cotter pins and gaskets to the high standard of quality required by the B&B Line throughout.
8. Long links and pins in large size back pressure valves of from 7″ to 12″ selected material accurately machined and fitted.

Roughing-in Dimensions

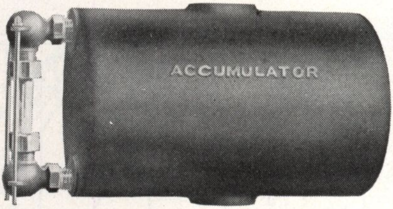


Size	A	B	C	D
1½″	11″	6″	7½″	24″
2″	11″	6″	7½″	24″
2½″	12″	7″	8½″	24″
3″	14″	7″	9″	24″
3½″	14″	7″	9″	24″
4″	16″	10″	11″	24″
5″	19¾″	12″	13″	30″
6″	19¾″	12″	13″	30″
7″	20¼″	16″	22″	30″
8″	20¼″	16″	22″	30″
10″	29¼″	18″	27″	30″
12″	31″	24″	36″	30″

Performance: The free area of the valve is greater than the exhaust pipe area, thus ample relief is afforded, and they are absolutely free from sticking, binding and overloading.

The B&B Line of Accumulators

The B&B Accumulator is a cast iron device designed to always be partly filled with water, the surface of which transmits pressure to the diaphragm of a pressure regulating valve through a governing pipe. A water seal is formed for the valve diaphragm and a cushion results that effectively prevents surging of the valve, eliminating shocks to the diaphragm. This device likewise reduces to a minimum the change in static head in the governing pipe on the diaphragm, a very desirable feature as other connections often cause as much as 1 pound variation in this respect. The B&B Accumulator causes a constant water level in the line, equalizing connections, maintaining it half full at all times. The B&B Accumulator should be used in connection with the B&B Line of Pressure Regulating Valves for extremely accurate control.



The B&B Accumulator is made in one size only. Size, pattern serial number and weight being as follows:

Size Inlet and Outlet Pipe	Part Number	Weight Lbs.
1¼″	15203	28½

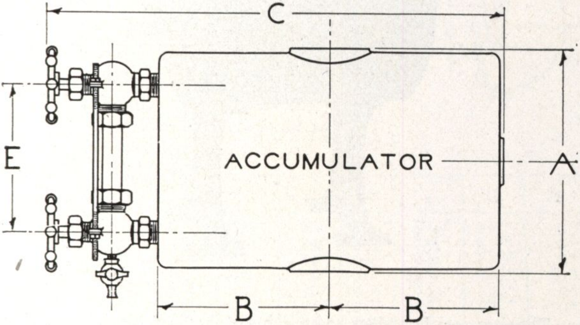
Gauge glass is not considered standard equipment with this specialty, and if wanted, must be specified extra, at additional cost.

The B&B Line of Accumulators

Specifications, Roughing-in and Performance Data

1. Body casting of fine grained grey iron, accurately cored and cleaned after casting. Painted black.
2. Inlet and outlet tappings 1¼″, accurately centered and machined
3. End opening ½-inch, accurately centered, drilled, threaded and plugged.
4. Openings for gauge glass accurately centered, drilled and threaded for ½″ pipe, and plugged.
5. If gauge glass is wanted, standard ½″ gauge cocks supplied with ½″ glass. Not supplied as standard equipment, and only if specified, at extra cost.

Roughing-in Dimensions



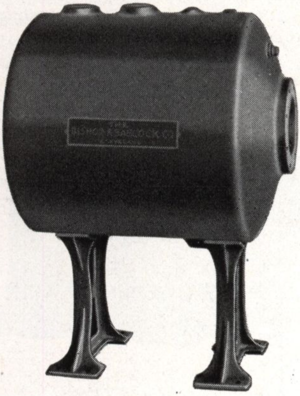
Size	A	B	C	E
1¼″	7⅛″	5½″	14¾″	4$\frac{11}{16}$″

Performance: The B&B Accumulator will effectively prevent surging of pressure regulating valves when installed with equalizing connections. It permits of very accurate control of pressure, and its use prevents the motion of the diaphragm of a pressure regulating valve from affecting the level of the water in the governing pipe.

The B&B Line of Cast Iron and Steel Receiving Tanks

The B&B Line of Cast Iron or Steel Receiving Tanks are offered for service in conjunction with the electric switch float operated, or steam valve float operated, for steam or electric pumps. The auxiliaries that make such service possible are described in their respective sections.

All B&B Receiving Tanks are furnished with cast iron cradles, affording a neat serviceable and correct setting.



The sizes, serial numbers and weights of the B&B Line of Receiving Tanks are as follows:

Serial Nos.			Weight
8705	1.	20″x24″ Cast Iron	350
8715	2.	24″x30″ Steel Plate, All Joints Welded	160
8725	3.	24″x36″ Steel Plate, All Joints Welded	165
8735	4.	24″x48″ Steel Plate, All Joints Welded	175
8745	5.	30″x36″ Steel Plate, All Joints Welded	185
8755	6.	36″x48″ Steel Plate, All Joints Welded	200

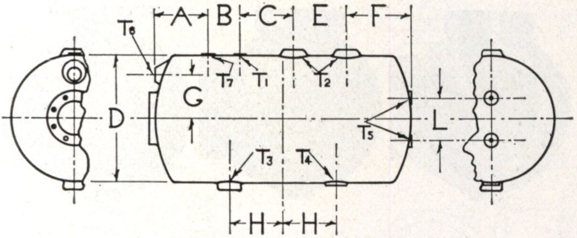
All the B&B Line of Receiving Tanks are subjected to a hydraulic test for tightness and are guaranteed to be tight.

The B&B Line of Receiving Tanks

Specifications, Roughing-in and Performance Data

1. The 20″x24″ B&B Receiving Tank is a clean grey iron casting, all pipe openings being accurately machined and centered.
2. The other members of the series are steel plate tanks, accurately rolled to shape, and with heads dished. All joints are welded.
3. All tanks accurately tested by hydrostatic test for tightness.
4. All pipe bosses, special rolled bosses, accurately spaced and welded into place. Large flange coupling at end of each tank accurately drilled to standard bolt circles.
5. All B&B Receiving Tanks are furnished with supporting cradles.
6. Tanks are tapped for various pipe connections depending upon the size of tanks with which they will be used.
7. All tappings to standard pipe taps.
8. Tanks and cradles finished in black serviceable paint.

Roughing-in Dimensions



Size	A	B	C	D	E	F	G	H
1	5⅞″	0″	6⅝″	20″	8¾″	2⅜″	8¼″	0″
2	6″	4¼″	5½″	24″	6¾″	7½″	8¼″	6″
3	6″	6″	6″	24″	10½″	7½″	8¼″	9″
4	10″	6″	10″	24″	10″	12″	8¼″	10″
5	6″	6″	6″	30″	10½″	7½″	8¼″	9″
6	10″	6″	10″	36″	10″	12″	8¼″	10″

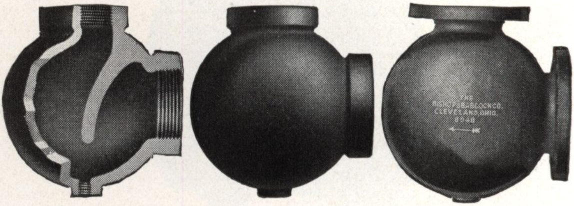
Size	T_1	T_2	T_3	T_4	T_5	T_6	T_7
1	1¼″	3″	3″	0″	½″	1″	0″
2	1″	3″	3″	1″	½″	1″	½″
3	1″	3″	3″	1″	½″	1½″	½″
4	1″	3″	3″	1″	½″	1½″	½″
5	1″	3″	3″	1″	½″	1½″	½″
6	1″	3″	3″	1″	½″	1½″	½″

Performance: The B&B Line of Receiving Tanks are of sufficient holding capacity to be of adequate service with electric boiler feed or steam pumps for the following heating service:

1.	20x24″	Cast Iron	10,000	Square	Feet	Heating	Surface
2.	24x30	Steel	20,000	"	"	"	"
3.	24x36	Steel	35,000	"	"	"	"
4.	24x48	Steel	45,000	"	"	"	"
5.	36x48	Steel	60,000	"	"	"	"
6.	30x36	Steel	45,000	"	"	"	"

The B&B Line of Suction Ells

The B&B Line of Suction Ells is designed to collect condensation at the base of the lowest point in return mains, and permit this accumulation to readily be drawn into the suction chamber of the vacuum pump. They virtually lift condensation over an obstruction or from one level to another. The baffle plate inside the pot of the ell forms a water seal up to the lift point, and thus horizontal mains will not become water logged but are completely drained. The B&B Line of Suction Ells is for vertical lifts only, the vertical pipe connection being one size smaller than the horizontal.



The sizes, patterns, serial numbers and weights of this B&B Line are as follows:

Suction	Dis-charge	Type	Serial Number	Weight Lbs.
¾″	½″	screwed	3735	1½
1 ″	¾″	screwed	3745	2
1¼″	1 ″	screwed	3755	3
1½″	1¼″	screwed	3765	4½
2 ″	1½″	screwed	3775	6
2½″	2 ″	screwed	3785	11
3″	2½″	screwed	3795	16
3½″	3 ″	screwed	5145	25
4 ″	3½″	flanged	5155	50
6 ″	5 ″	screwed	5165	70
8 ″	6 ″	flanged	5175	90

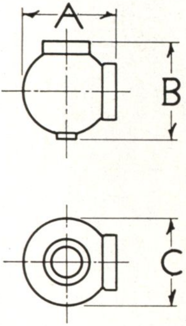
The B&B Suction Ells are made with a sufficient radius to the curves to prevent frictional losses, the momentum of water is maintained and assists in making the lift with the minimum loss of vacuum. A tapping in the bottom of the ell is provided for clean out, should this ever be necessary.

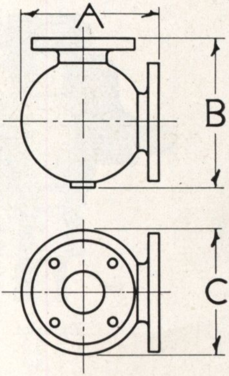
The B&B Line of Suctions Ells

Specifications, Roughing-in and Performance Data

1. All castings of fine grained grey cast iron. Perfectly cleaned accurately machined.
2. Sizes ¾′ to 3″ inclusive, furnished tapped.
3. Sizes 3½″ to 8″ inclusive, furnished flanged. Flanges drilled to standard bolt circles, but companion flanges not furnished as standard equipment. If companion flanges are wanted they must be specified.
4. Every suction ell furnished with drilled, tapped and plugged opening at base, for cleanout.
5. All B&B Suction Ells finished black.

Roughing-in Dimensions



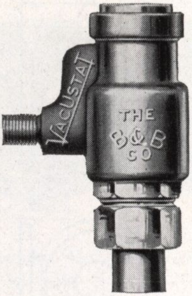


Size	A	B	C
¾″	2½″	3⅛″	2¼″
1 ″	3 ″	3 9/16″	2¾″
1¼″	3 11/16″	4⅛″	3¼″
1½″	4 11/16″	5 1/16″	4⅛″
2 ″	5⅛″	5⅝″	4¾″
2½″	6 9/16″	7 ″	6¼″
3 ″	7 15/16″	8⅜″	7⅜″
3½″	10 ″	10 11/16″	8 15/16″
4 ″	11 ″	11 11/16″	9 15/16″
6 ″	15½″	16 3/16″	14 7/16″
8 ″	17 5/16″	19⅝″	16⅝″

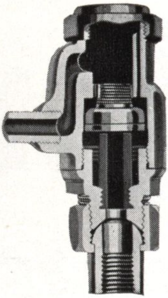
Performance: A B&B Suction Ell forms a seal. Vacuum will not reach the return main to which it is connected until the return line is free from condensation. When free from condensation, suction takes place and vacuum is maintained. Hammer is positively eliminated.

The B&B Line of Vacu-Stats

The B&B Line of Vacu-Stats is a specialty in a class by itself, used for venting radiators on air line systems of heating. It has no carbon post or rod, which is relied upon so largely by other types of venting valves, to close and open a port. The Vacu-Stat makes use of an expansion button, a hand spun phosphor bronze member filled with a volatile liquid. The Vacu-Stat is a thermostatic valve which automatically keeps radiators and pipes free from air, and at the same time seals in steam. One is installed on each radiator or coil, and often at the end of a steam main to insure positive, thorough and quick circulation.



Exterior



Interior

The B&B Line of Vacu-Stats is furnished in two size connections as follows:

Size Inches	Serial Number	Net Weight
⅛x¼	1285	13 oz.
¼x¼	1295	13 oz.

The Vacu-Stat has three times the venting capacity of the average type of air valve, and their use insures of steam reaching radiators instantly, quick heating resulting. Each Vacu-Stat is thoroughly tested and properly adjusted at the factory, no adjustments being required in installation.

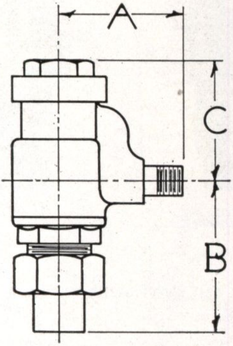
The B&B Line of Vacu-Stats

Specifications, Roughing-in and Performance Data

1. Body, top cap and bottom cap of heavy steam brass, polished and nickeled.
2. Inlet nipple of best steam brass, nickel finish, brazed to body.
3. Thermal member of hand spun phosphor bronze, filled with volatile liquid by the B&B process.
4. Valve seat of correct flexibility to positively and perfectly seat valve.
5. Swivel and nut of heavy brass, polished and nickeled.

The thermal member of the Vacu-Stat expands on contact with steam and closes the passage. On contact with air it contracts, allowing air to vent, connection being made through the swivel to the air line and thence to vacuum pump.

Roughing-in Dimensions



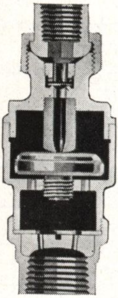
Size	A	B	C
⅛x¼	1¾″	2″	1¾″
¼x¼	1¾″	2″	1¾″

Performance: Vacu-Stats are guaranteed to relieve the air at all times and close against steam from any heating system to which applied. The capacity in square feet of direct radiation is 150 for each type. Operates on pressures up to 15 pounds.

The B&B Line of Vacu-Checks

The Vacu-Check is a heating specialty used for venting pipe coils, indirect radiators, and the ends of mains of air line systems of heating. It is a combination thermostatic valve and check valve. It permits the free passage of air from radiators and radiating equipment and prevents the return of air to the system. It prevents the escape of steam or vapor from the systems to which applied, and is installed on the end of the steam supply main. The Vacu-Check will not drain off water of condensation.

Exterior



Interior

The sizes, weights and serial numbers of the B&B Line of Vacu-Checks are as follows:

Size Inches	Serial Number	Net Weight
½"x ¼"	495	13 oz.
1 "x ½"	745	2¼ lbs.

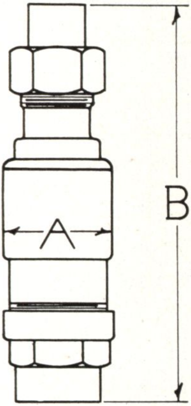
The Vacu-Check is positive seating, and is substantially made from heavy steam brass throughout. It is accurately and permanently adjusted at the factory. Operates on pressures up to 15 pounds.

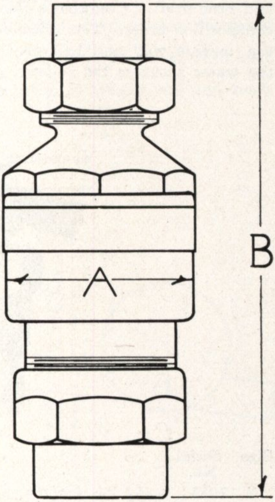
The B&B Line of Vacu-Checks

Specifications, Roughing-in and Performance Data

1. The Body, inlet cap and inlet cap washer of highest quality steam brass, accurately machined.
2. The outlet cap, outlet cap nut of highest quality steam brass, accurately machined.
3. Thermal member of hand-spun phosphor bronze by the special B&B Process, and filled by the B&B Process with volatile liquid.
4. Valve seat of the correct flexibility to positively and perfectly seat the valve.
5. Outlet swivel and nut of extra heavy high quality brass, accurately machined and fitted.
6. Each Vacu-Check is accurately and permanently adjusted at the factory.

Roughing-in Dimensions





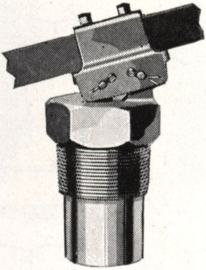
Size	A	B
½ x ¼″	1 5/16″	4½″
1 x ½″	2¼″	5¾″

Performance: The valve is provided with a diaphragm containing a volatile liquid that expands and contracts with rise or fall of temperature. The check feature prevents air from flowing back into lines after it has once been expelled. The two sizes have the following capacities:

Size	Capacity Sq. Ft. Direct Rad.
½ x ¼″	300
1 x ½″	1000

The B&B Line of Multiflex Hot Water Damper Regulators

The B&B Multiflex Hot Water Damper Regulator used on hot water boilers controls the temperature of water within 2 degrees Connected at top of boiler as illustrated and chain connecting front and rear draft. Contains a B&B Multiflex Bellows, made of special composition brass. The volatile liquid is hermetically sealed between the outside wall and bellows. The slighest temperature change of the water actuates the bellows.



Size	Serial No.	Weight
2″	7065	2¼ lbs. for thermal member only.
		11 lbs. for complete assembly, thermal member weight, rod, two pulleys, two hooks and 21 feet of chain.

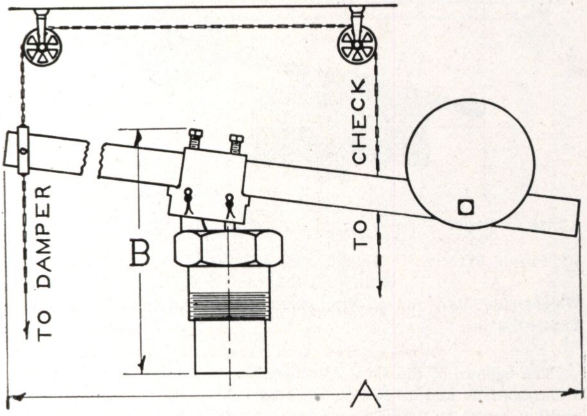
The thermal member is manufactured to the high standard of the B&B Line by the special B&B process of making Multiflex bellows of heavy metal, welded with block tin and not soldered, and filled with a volatile liquid giving great sensitiveness. The B&B Hot Water Damper Regulator saves its cost many times in fuel saving.

The B&B Line of Hot Water Damper Regulators

Specifications, Roughing-in and Performance Data

1. Thermal member body of high quality brass, accurately machined to which a spun copper base is tinned. Body threaded to a 2-inch pipe thread, and containing a B&B Multiflex Bellows, accurately tested, adjusted and filled with volatile liquid for this particular service. Rod yoke of pressed metal, and with twin set screws to hold weight rod where set.
2. Weight rod ¾″x¼″, flat rod cut to 36″ length, ends drilled to take hooks for chains.
3. Weight cast iron, slot accurately machined and fitted with ⅜″ set screw.
4. Chain for hooking to weight rod, and to furnace door furnished in 21-foot length.
5. Pulleys, 2″ shieve, finished black japan, two furnished with each regulator and with screw ends.
6. Two S-hooks provided to engage holes in weight rod and hook into end of chain.

Roughing-in Dimensions

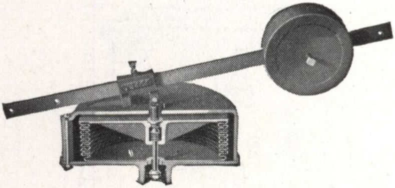


A=36″ B=6¾″

Performance: The B&B Hot Water Damper Regulator is a practical, automatic, universal type of thermal regulator for hot water installations. It controls the rate of combustion in proportion to the demand for heat, and being all metal without rubber or similar diaphragms it will last indefinitely. The sensitiveness of the B&B Hot Water Damper Regulator gives exact regulation, and a saving in fuel.

The B&B Line of Multiflex Vapor Damper Regulators

The B&B Vapor Damper Regular is specially designed for use on vapor installations. It automatically regulates the draft and maintains a constant pressure in the boiler at or near atmospheric pressure. The 8″ B&B Multiflex Vapor Damper Regulator will control pressures when properly installed to a variation of not over TWO ounces of the point to which set. The diaphragm cannot be blown out and no precautions from excess pressures or high vacuums are necessary.



Size	Serial No.	Weight
1″ Pipe	5715	Weight, rod, 2 pulleys, 2 hooks, and 21′ chain=8¾ lbs. total weight.

Weight=5¼ lbs., rod=2 lbs., chain pulleys and Hooks=1½ lbs. Total=8¾ lbs.

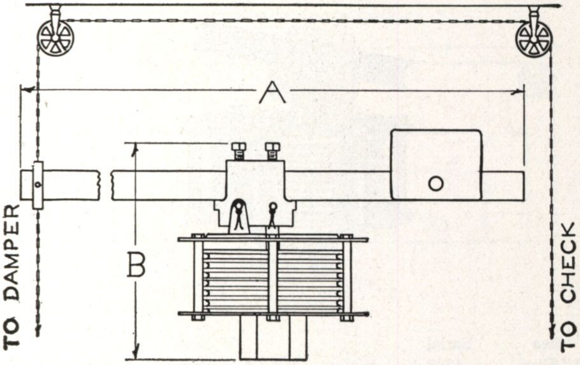
The bellows of the B&B Multiflex Vapor Damper Regulator has 8 corrugations and 16 flexing surfaces and is made of special composition brass, no solder being used at joints, but special block tin sweated joints, insuring of tightness and durability.

The B&B Line of Multiflex Vapor Damper Regulator

Specifications, Roughing-in and Performance Data

1. Multiflex bellows, 8″ in diameter, extremely sensitive and made from selected material by the B&B process. Will operate on pressures up to 10 pounds.
2. Body and cover of heavy casting, finished black. Fastened to bottom plate and thermal member.
3. Diaphragm stem, of the best steam brass, accurately fitted.
4. Rod yoke of pressed metal, fully nickeled; provided with twin set screws.
5. Weight, rod, lock nuts, bolts and fittings to the B&B standard of quality.
6. Pipe connection 1″.

Roughing-in Dimensions



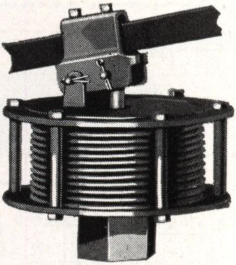
A=36″ B=6½″

Performance: The B&B Multiflex Vapor Damper Regulator is supersensitive, and will automatically control vapor pressure to within 2 ounces of the point at which set, and for a range from atmospheric to 16 ounces or more vapor pressure. When the vapor pressure rises above the point to which set, the multiflex diaphragm expands, raises the weighted lever, which opens the check and closes the draft dampers by means of the connecting chains. Conversely when the pressure drops, the drafts are automatically reversed.

The B&B Line of Multiflex Steam Damper Regulators

The B&B Steam Damper Regulator is a damper regulator making use of the B&B Multiflex Bellows manufactured by the B&B process. The bellows are made by a special process from special and selected metal and will withstand hard usage for an indefinite period. In shop tests at the B&B factory our bellows have been flexed over 200 million times, no change of structure occurring, in fact, such bellows showing practically no alteration from the original state.

Heavy top and bottom plates with rod separators protect the moving part, the lever is evenly balanced and the device extremely sensitive. No valve is required between the boiler connection and the regulator, as no precaution from excess pressure or high vacuum is required.



Size	Serial	Weight
1″ Pipe	4395 A	Weight, rod, 2 pulleys, 2 hooks, and 21 feet of chain=8¾ lbs. Complete Assembly=12½ lbs.

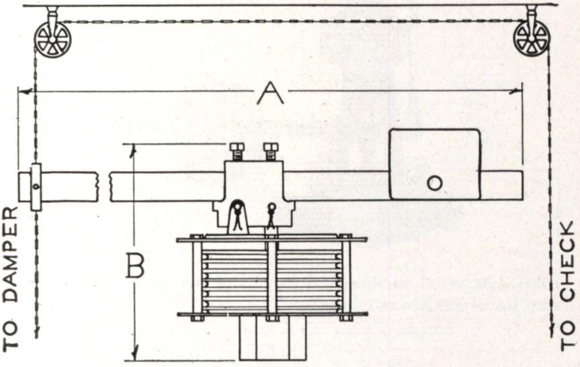
The B&B Steam Damper Regulator is for use on low pressure boilers, operates directly from boiler pressure without motors or other means, and automatically controls to within ¼-pound boiler pressure, by operating the draft and check dampers. The moveable weight gives a range of pressures from ½-pound to 15 pounds.

The B&B Line of Multiflex Steam Damper Regulators

Specifications, Roughing-in and Performance Data

1. Multiflex bellows of selected materials, specially heavy, and manufactured by the B&B method. Suitable for pressures up to 15 pounds.
2. Body and cover of accurately made stampings, finished frosted nickel. Pipe boss of best steam brass, securely fastened to assembly.
3. Rod yoke of pressed metal, fully nickeled, provided with twin set screws to hold weight rod where set.
4. Diaphragm stem of best brass, accurately machined and fitted
5. Weight rod, weight, lock nuts, machine bolts to the B&B standard of quality.

Roughing-in Dimensions



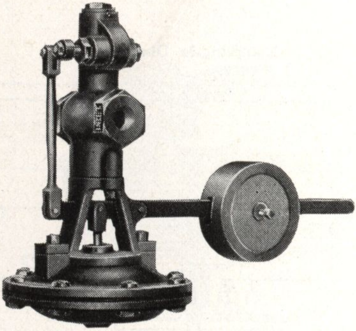
A=36″ B=6½″

Performance: The B&B Multiflex Steam Damper Regulator is extremely sensitive and will automatically control pressure to within ¼-pound to which set, and for a range of from ½-pound up to 15 pounds. When steam pressure rises above that for which set, the multiflex diaphragm expands, raises the weighted lever, which opens the check and closes the draft damper through the connecting chains.

The B&B Line of Steam Vacuum Pump Governors

The B&B Steam Vacuum Pump Governor is designed for use in connection with steam driven vacuum pumps, or where a certain number of inches of vacuum are to be maintained. It is made in sizes from ⅜″ to 1½″ inclusive, for controlling the speed of steam operated vacuum pumps and for maintaining any degree of vacuum. The valve is perfectly balanced and will not surge, the vacuum pump being at all times under perfect control. The diaphragm and all working parts are readily accessible without disturbing pipe connections.

The valve is of the piston type, perfectly balanced, and will operate with a variation of ½-inch of vacuum. The seat area is 10% larger than the pipe connections, and full steam pressure is transmitted to the cylinder of the pump.



The sizes, serial numbers and weights of the B&B Steam Vacuum Pump Governors are as follows:

Size	Serial Number	Weight Lbs.
⅜″	3385	27
½″	3195	27
¾″	3205	27
1″	3215	27
1¼″	3375	33
1½″	3815	33

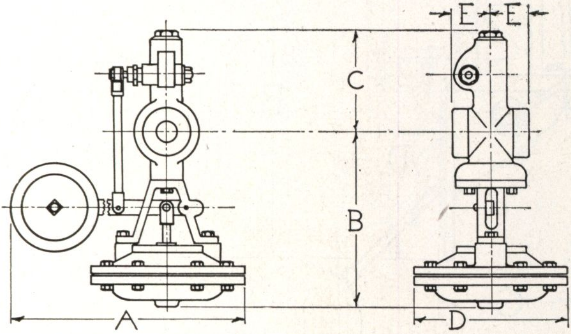
If these governors are used for any other purpose than controlling a vacuum pump it is desirable to specify the exact service, so that the governor can be altered to meet such requirements.

The B&B Line of Steam Vacuum Pump Governors

Specifications, Roughing-in and Performance Data

1. Body and bracket of fine grained grey cast iron, accurately machined.
2. Valves of wear-resisting, selected bronze, perfectly balanced. Piston type, 3 disc.
3. Links, levers and shaft of medium open hearth steel, accurately machined.
4. Brass caps, stuffing box nuts, valve bushings of the best steam brass.
5. Screws, nuts, bolts and set screws to the B&B standard of quality.
6. Diaphragm selected specially manufactured rubber composition to the B&B standard.
7. Diaphragm washers and nut of the best brass, accurately machined.

Roughing-in Dimensions



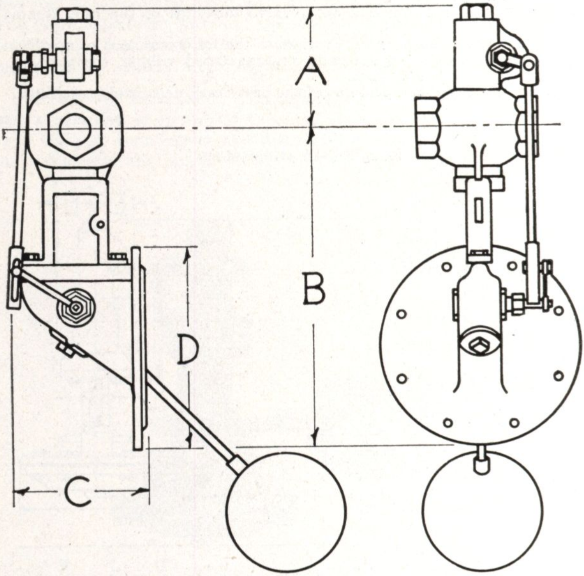
	A	B	C	D	E
⅜″	18⅛″	8½″	5″	7¾″	2″
½″	18⅛″	8½″	5″	7¾″	2″
¾″	18⅛″	8½″	5″	7¾″	2″
1″	18⅛″	8½″	5″	7¾″	2″
1¼″	18⅛″	9⅝″	5¾″	7¾″	3″
1½″	18⅛″	9⅝″	5¾″	7¾″	3″

Performance: The B&B Steam Vacuum Pump Governor will operate with a variation of but ½-inch of vacuum, and because of the large seat opening, full steam pressure is transmitted to the steam piston. This valve is good for variable vacuum conditions, suitable for low vacuums and suitable for high vacuum work.

The B&B Line of Float Head and Steam Pump Governor Attachments

The B&B Float Head and Pump Governor is designed to control the steam operated boiler feed pumps, so that water of condensation entering the receiver will be discharged immediately into the boiler. This head and pump governor attachment is used in connection with the B&B Line of Receiving Tanks.

Roughing-in Dimensions



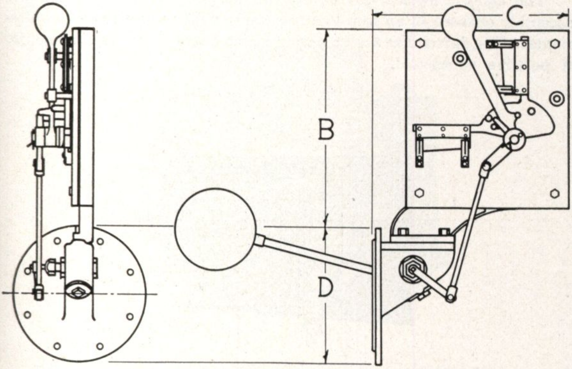
A	B	C	D
5¾″	15½″	7″	10″

Size Inches	Serial Number	Weight Lbs.
⅜	8505	37
½	8515	37
¾	8525	37
1	8535	37
1¼	8545	37
1½	8555	37

The B&B Line of Float Heads and Electric Switches

The B&B Float Head and Electric Switch attachment is designed to automatically start and stop electrically driven pumps automatically, so that water of condensation entering the receiver will be discharged immediately into the boiler. This float head and electric switch attachment is used in connection with the B&B Line of Receiving Tanks.

Roughing-in Dimensions



B	C	D
14½″	12″	10″

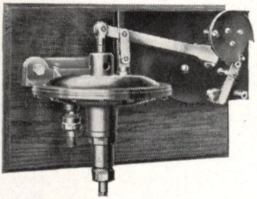
Size	Serial No.	Weight Lbs.
1 Pole	8765	46
2 Pole	8775	46
3 Pole	8785	46

The switch is of the positive or snap-acting type, opened or closed by a weighted lever, insuring of positive contact and preventing arcing. The switch board is of selected slate supported on the cast iron bracket and head piece, and is perfectly insulated.

The B&B Line of Electric Switch and Vacuum Controllers

The B&B Line of Electric Switch and Vacuum Controllers is an automatic electric control for operation of electrically operated vacuum pumps. A switch is actuated by a diaphragm and which can be adjusted externally to any desired degree of vacuum.

The electric switch is mounted on a slate back, and the entire assembly encased in an iron box to comply with underwriters' requirements. The switch has a snap action which prevents arcing and insures of positive contact.



The B&B Electric Switch and Vacuum Controller is made in but one size, the serial number and weight being as follows:

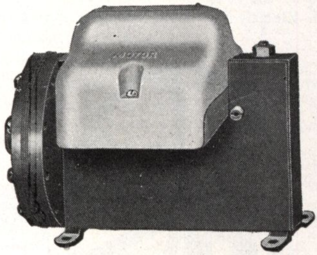
Item	Serial No.	Weight
B&B Electric Switch and Vacuum Controller	1859	22 lbs.

The switch should be connected with a magnet control switch where polyphase or direct current motors are used.

Size of over all dimensions 8½"x15".

Electric Switch and Pressure Controller

The electric switch and pressure controller is used to automatically start and stop an electric driven air compressor used on temperature control systems. The switch will maintain a pressure of 30 lbs. in the receiving tank and is suitable for either direct or alternating current, for motors up to 2 H. P. The adjustments of this automatic control are made to cut in at approximately 23 lbs. and out at 30 lbs. or other suitable pressures.



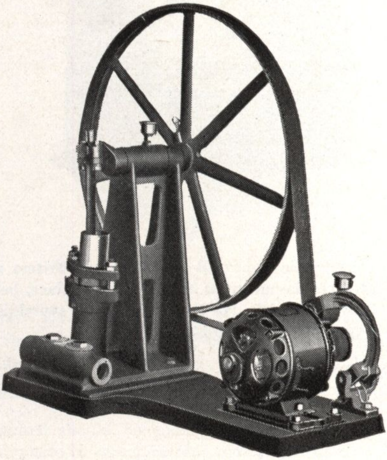
The electric switch is approved by the Underwriters and is so constructed that it can be mounted in any suitable place, being of the inclosed type, fully protected, No cross line starter switch is required when using this type of pressure control.

Size of over all dimensions 6¾″ long, 5″ wide, 5¾″ high. Weight 8 lbs

The B&B Line of Electric Air Line Vacuum Pumps

The B&B Line of Electric Air Line Vacuum Pumps is designed to draw all air from radiators on Air Line Vacuum Systems through the air piping. The B&B Air Line Vacuum Pumps are of the plunger type, self-contained upon a single bed plate with the motor. They are of exceptionally heavy construction with bronze lined cylinders special hard composition valves with bronze seats and stems. The valves are easily accessible for renewal. The pump is driven by belt to the motor, a belt tightener provided.

The B&B Electric Air Line Vacuum Pump No. 1279



The size, serial number and weight are as follows:

Serial No.	Cylinder Diameter	Stroke	Suction	Dis-charge	RPM	H.P.	Weight
1279	2¼″	3″	1″	1″	75	1/6	370

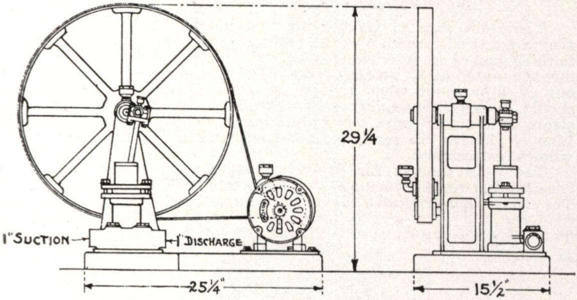
The B&B Line of Electric Air Line Vacuum Pumps

The B & B Electric Air Line Vacuum Pump No. 1279

Specifications, Roughing-in and Performance Data

1. Motor and pump mounted on a single base of grey cast iron, accurately machined.
2. Pump a single cylinder, plunger type, bronze lined cylinders.
3. Valves of hard special composition with bronze seats and stems.
4. Belt driven, with belt tightener as standard equipment.
5. Bearings full bronze, provided with brass grease cups.
6. Standard equipment furnished with the pump includes:
   A. 1 18-gallon tank.
   B. 1 B&B Electric Air Line Vacuum Pump No. 1279.
   C. 1 Automatic Electric Switch and Vacuum Controller No. 1859.
   D. 1 B&B Suction Strainer 4619.
   E. 1 B&B Vacuum Gauge.
7. Motor to suit electrical characteristics of proposed installation and which must be completely described. For polyphase 25-cycle or 550-volt current an extra cross the line switch must be used, and is not listed above.

Roughing-in Dimensions
Foundation and Clearance Dimensions



Performance: The B&B Electric Air Line Vacuum Pump No. 1279 is furnished as a complete outfit, including tank gauge motor and switch, constructed of the highest quality materials and workmanship, and is complete in every respect. Operated at rated speed it has the following capacity:

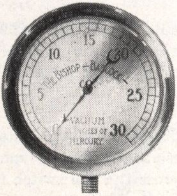
Pump Unit	Suction	Discharge	Strokes per Min.	H.P.	Capacity max. in Sq. Ft. Direct Rad.
No. 1279	1"	1"	150	1/6	3000

The B&B Line of Gauges

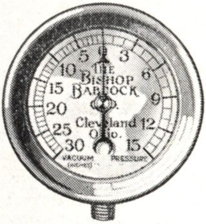
The B&B Line of Gauges embraces both the vacuum type and the compound type.

The vacuum gauge is used for accurately indicating the pump performance. It is connected to the expansion tank in series with the tank and vacuum controller, and it is a convenient means for setting the vacuum control switch.

The compound gauge is placed on the boiler, indicating steam pressure as well as vacuum, as the case may be, and is required on vacuum and vacu-vapor systems of steam circulation. The dial is graduated to 15 pounds steam pressure on the right-hand side of the dial, and to 30 inches of vacuum on the left-hand side. The compound gauge is 5″ in diameter, brass trimmed, and having a ¼″ pipe connection.



Vacuum Gauge

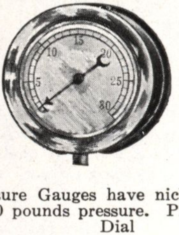


Compound Gauge

Gauge Type	Diameter	Pipe Connections	Weight
Vacuum	5″	¼″	2 lbs.
Compound	5″	¼″	2 lbs.

The B&B Line of Gauges are individually tested for accuracy, they are a tried, tested, measured and adjusted line. All similar parts in these gauges are interchangeable, and all have a non-corrosive movement mounted direct on the socket. The movement cannot be thrown out of adjustment when the gauge is being installed. Any gauge should be kept reasonably cool to register correctly, and hence on steam and vacuum work a coil pipe siphon should be used. The B&B Line of Gauges are sensitive, non-freezing and the pointer will not vibrate excessively.

The B&B Line of Air Pressure Gauges are of the same quality construction as the vacuum and compound gauges described above. They have non-corrosive movements mounted direct on the socket.



The B&B Air Pressure Gauges have nickel-plated trim, flanged back, and register to 30 pounds pressure. Pipe connection is ¼″.

Type	Dial	Weight
Air	2½″	1 lb.
Air	3½″	1½ lb.

The B&B Line of Gauge Boards

For use with vacuum systems. This outfit comprises one board of wood, slate or marble, 11 inches wide and 26½ inches long, one vacuum gauge for indicating the degree of vacuum produced by the pump, and one compound gauge for indicating the pressure or vacuum on the boiler. Also one nickel plated brass name plate and pet cocks for each of the gauges, and four nickel plated screws or bolts for attaching board to wall.

B&B Gauge Board

Type	Weight
Wood	40 lbs.
Slate	47 lbs.
Marble	47 lbs.

For use with heating systems a vacuum and compound gauge is mounted side by side as illustrated. The gauges are finished in highly polished nickel, and nickel-plated pet cocks are provided. A set of four nickel-plated screws or bolts to attach the gauge board to the wall is standard equipment with each gauge board.

The B&B Line of All-Metal Thermostats

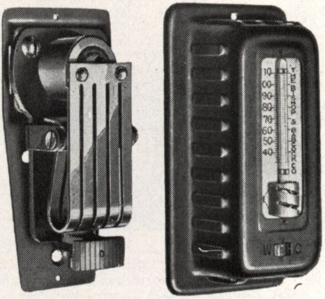
The B&B All-Metal Thermostat is furnished in special types for all vapor and steam heating installations. They assure exact heat control. When the B&B All-Metal Thermostat is used in conjunction with the B&B Multiflex Pneumatic Valve, the most complete and efficient temperature control system is possible.

As standard equipment the B&B All-Metal Thermostat is offered in three types, the Graduate type, the Positive type, and the Compound type.

The Positive Type Thermostat is of such construction that it is either fully open or tightly shut, that is, there is no intermediate position. It is used extensively on 1-pipe steam systems.

The Graduate Type Thermostat is of such construction that it throttles, that is, it will maintain a valve in an intermediate position, It is used extensively on vacuum and vapor systems.

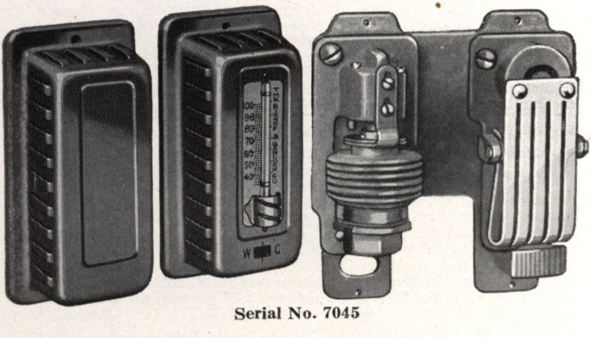
The Compound Type Thermostat is a combination of both Positive and Graduate types. The positive feature operates radiators. while the Graduate feature is utilized to operate dampers, i. e. the ventilating in a split system or partly direct, and partly indirect system of heating.



Serial No.
Graduate 5625

Positive 7115

Positive or Graduate Type Thermostat



Serial No. 7045

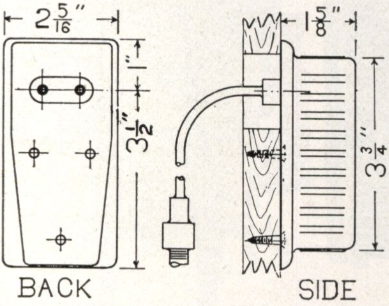
Compound Type Thermostat

The B&B Line of All-Metal Thermostats

Specifications, Roughing-in and Performance Data

1. All-Metal, all parts accurately proportioned, cover metal and supplied in any finish to match room hardware.
2. Moving parts a single element, this being a double seated air valve operated directly by the thermal member.
3. Thermal element an INVAR sheet with no thermal expansion welded to brass sheet of high thermal expansion.
4. Thermal member slotted longitudinally to eliminate cross deflection and to give added radiation surface, making this thermostat highly sensitive and controlling temperature within limit of less than one degree.
5. Frame of such a design that operation of thermal member is not affected by expansion and contraction of it due to wall temperature.
6. Air valve a large port valve, operating stem moving up and down through port, preventing dust clogging, and being self-cleaning.
7. Key Adjustment.

Roughing-in Dimensions



Performance: The B&B All-Metal Thermostat when installed in conjunction with the B&B Multiflex Pneumatic Valve and in accordance with installations meeting with the approval of the B&B engineers will positively control the temperature in a room or group of rooms to within 1 degree Fahrenheit of the point at which set.

The B&B Thermostat is a pneumatic thermostat that should be located about 5 feet from the floor of the room whose temperature it regulates, as at this point the mean temperature is obtainable. On a rising temperature the metallic element expands, opening the pneumatic valve and closing the exhaust to atmosphere, thus allowing compressed air at 15 pound pressure to pass through the thermostat to the B&B Pneumatic Valve. The B&B Pneumatic Valve acts on 15 pounds pressure, the spring therein is compressed and the valve closes, shutting off the steam supply to the radiator. On a falling temperature the reverse takes place, the exhaust in the thermostat opens and the air pressure lessens due to the escape of air, and the valve in the B&B Pneumatic Valve automatically opens. The combination is extremely sensitive, positive, and controls temperature within limits of less than 1 degree.

THE BISHOP & BABCOCK ALL-METAL DUPLEX THERMOSTAT

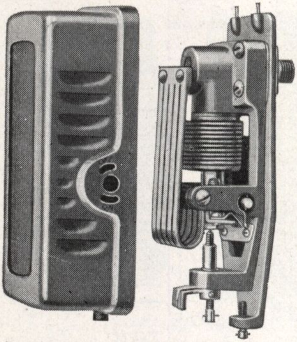
The B&B All-Metal Duplex Thermostat is the latest development in Temperature Control Apparatus for applications of Temperature Control to buildings where control of individual rooms or sections is desirable.

From a standpoint of economy both of installation and operation the apparatus is far in advance of anything that has been produced to date to combine individual and group control, with complete control of the building, for schools, office buildings, hotels and public buildings.

The use of this instrument makes it possible without any elaborate arrangement of piping and hand-control valves to operate the entire building with control when desired, and at the same time provides a method whereby any one room or section or group of rooms in the building may be provided with heat, while the portions of the building in which heat is not desired are cut off from the source of steam, except where the temperature drops to a point sufficiently low to make freezing temperature a possibility.

The apparatus is tried and proven, has been specified and indorsed by some of the leading engineers in the country, and is in use in many large public buildings.

The B&B All Metal Duplex Thermostat is manufactured in positive, intermediate and compound types, and is used in connection with the B&B Multiflex All Metal Pneumatic Valves and other specialties.



Serial No.
Positive—9125
Graduate—9145
Compound—9155

Distinctive features of the Thermostat include the following:

All metal; accurately proportioned; covers supplied in any finish to match hardware.

Highly sensitive, controlling temperature within limit of less than one degree.

Simple mechanism, with but two moving parts—a double-seated air valve operated directly by the thermal member, and a bellows used to move the thermal member into position when normal operating air pressure is put into the piping system.

Thermal member mounted on frame; operation not affected by expansion and contraction of frame due to wall temperature.

Thermal member slotted longitudinally to eliminate cross deflection and to give added radiation surface.

Metal is sheet of Invar (a special nickel steel) having practically no thermal expansion welded to sheet of high expansion brass.

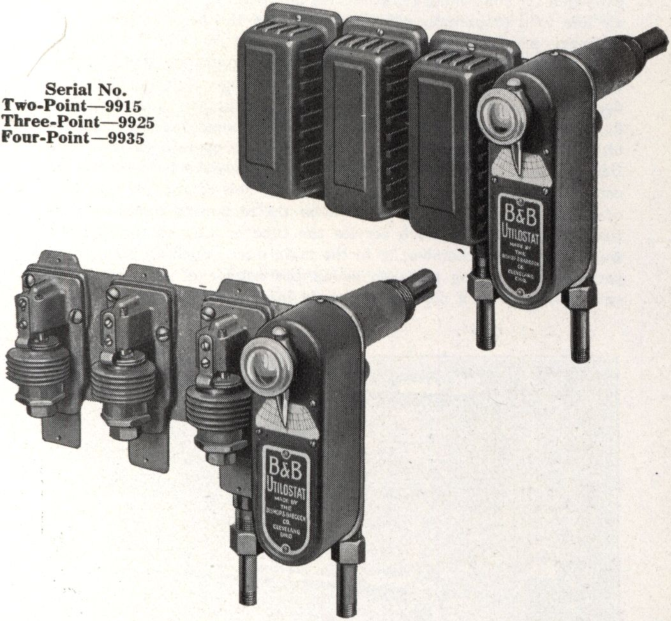
Air valve is a large port valve with operating stem which moves up and down through port; thus it cannot clog with dust; self-cleaning

No microscopic holes for passage of air.

The operation of the thermostat is such that no change is required in the regular method of installing air piping except that an additional small line is run from the source of air supply which is connected to the bellows of each instrument. In this line is placed a control valve.

COMPOUND UTILOSTAT

Serial No.
Two-Point—9915
Three-Point—9925
Four-Point—9935



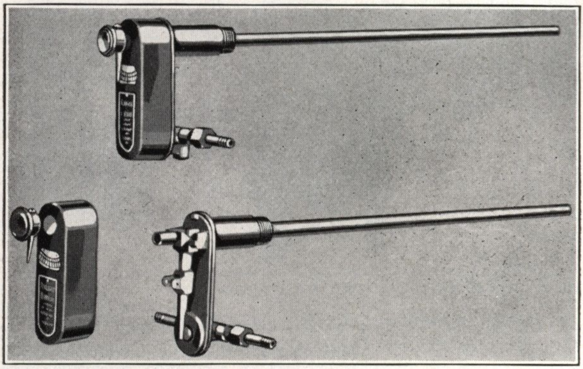
This instrument is designed to function on the same principle as the Bishop & Babcock Utilostat described on the following page, and to accomplish the same result as an installation of several individual Utilostats, the relay instruments being used to control vento coils for example, with graduate action thru the Utilostat member on dampers.

The amount of piping is reduced in making the installation and a more satisfactory and workmanlike job is possible than with unit controls with individual Utilostats.

The instrument is made positive or graduate type with one, two or three points or relay members in accordance with the requirements of the installation.

The B&B Line of Utilostats

The B&B Utilostat is an all-metal thermostat with a tubular extension for controlling temperatures by operating an air port in the air line to a diaphragm valve that controls the heat supply. It is extremely sensitive, operating on a temperature range of but ¼ to ⅛ of a degree Fahrenheit. It will make four expansions and contractions per minute, and it has an operating range of from 50 to 600 degrees Fahrenheit. It is of durable construction, provided with knife edged bearings, and contains no stuffing boxes or similar sources of trouble. The B&B Utilostat is designed to operate on air. The B&B Utilostat when used with other B&B specialties for temperature control, pneumatically controls pipe coils or coil valves, vent sections or by-pass dampers, and located under the tempering coils in a ventilating system. For such service the tube is inserted through the wall of a Plenum chamber, or in the main duct. Such an installation permits the working parts to be on the outside of the ventilating equipment and in a position for ready inspection and adjustment.



The service, serial number and weight of the B&B Line of Utilostats are as follows:

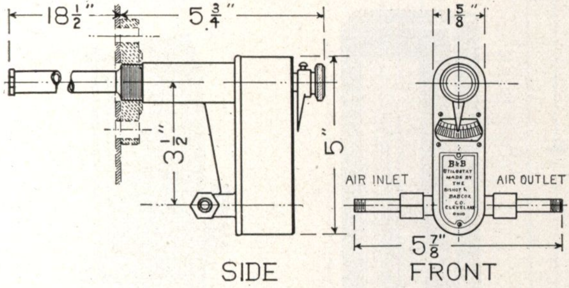
For Use With	Serial No.	Weight
Air. Graduate	2125	4 lbs.
Positive	4405	4 lbs.

The B&B Line of Utilostats

Specifications, Roughing-in and Performance Data

1. All-metal, all parts accurately proportioned, cover durably finished in dull black, non-corrossive.
2. Moving part a single element, this being a double-ported air valve, operated directly by thermal element.
3. Thermal element is a seamless brass tube
4. Tube, a seamless brass tube, brazed joints at end and where it is fastened to frame.
5. Frame of a design that prevents interference due to its expansion with the functioning of the expansion member.
6. Air valve, a large port valve.
7. Hand screw or key adjustment.

Roughing-in Dimensions


18½"
5¾"
3½"
5"
1⅝"
AIR INLET
AIR OUTLET
B&B UTILOSTAT MADE BY THE BISHOP & BABCOCK CO. CLEVELAND OHIO
5⅞"
SIDE
FRONT

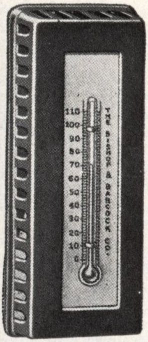
Performance: The B&B Line of Utilostats will effectively control the temperatures of liquids, gases or air at practically the point at which set. It is of service and well adapted to the following usage, for controlling the temperatures of apparatus of all kinds.

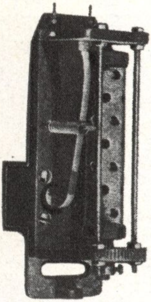
1. Closed, induction or barometric feed water heaters.
2. Tank and storage, heaters, using live or exhaust steam, gas or coal fuel.
3. Hot water heating systems, and air duct temperatures in ventilation.
4. Fuel oil heaters, and tempering oil baths.
5. Processes in paper, wood preservation, pasteurization, textile finishing and similar work.
6. For cookers, digesters, and all manner of similar industrial equipment.
7. For control of distillates and fractional distillation of all kinds.

In short, wherever there exists the necessity of control of temperature, the Utilostat is of service INDUSTRIALLY.

The B&B Line of Hygrostats

The B&B Hygrostat is a device for controlling humidity, and is of service in connection with temperature control systems. A sensitive wooden cylinder of cross-grained maple is the actuating element. The expansion of this element when the humidity rises, causes a port to open in the valve mechanism which permits compressed air to actuate a diaphragm valve. The diaphragm valve operates a humidifier, operating a spray head, water pan or similar arrangement. Contraction of the maple element shuts off the air, exhausting to the atmosphere in doing so, and the diaphragm valve is not balanced and causes the spray heads to operate until the humidity reaches a point at which the Hygrostat is set.





The B&B Hygrostat is furnished in but one size, but in finish to match room hardware. The serial number and weight are as follows

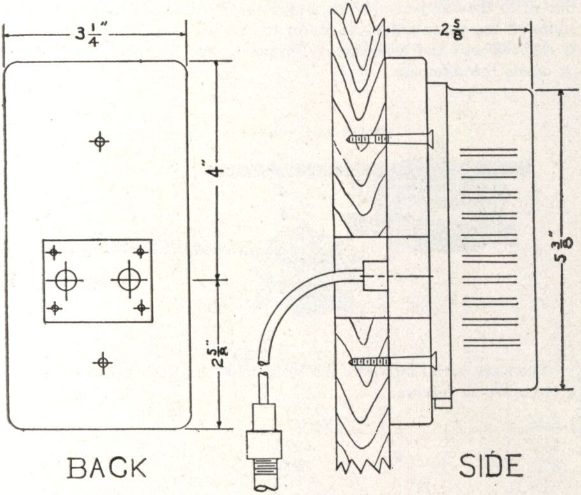
Item	Serial No.	Weight
Room Type	5115	2 lbs.
Duct Type	8675	

The B&B Line of Hygrostats

Specifications, Roughing-in and Performance Data

1. Cover and frame metal, accurately machined and any finish.
2. Moving part, double seated air valve, operated by actuating element.
3. Actuating element of hard cross-grained maple, especially selected for sensitiveness to variation in humidity. Indestructible.
4. All parts accurately proportioned, adjusted and tested at the factory.

Roughing-in Dimensions

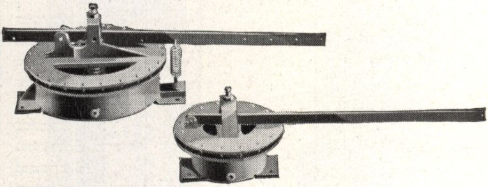


Performance: The B&B Hygrostat will control the humidity at the point where it is located within a range of 2% of the point at which it is set. For example, if set for a relative humidity of 58% it will open the valve on spray heads when the relative humidity falls to 57%. In turn when the relative humidity reaches 59% it will close the valve. The B&B Hygrostat is a sensitive and effective humidity controlling device.

The B&B Line of Damper Motors

The B&B Multiflex Damper Motors are for use in temperature control systems for controlling the mixing, by-pass, louvre or other types of dampers used on such systems to control ventilation. They are operated by compressed air and are connected by means of an ⅛″ air line to a B&B Thermostat or an Utilostat, or to a 3-way switch.

These damper motors are all-metal construction, the body being a heavy casting enclosing a multiflex diaphragm. The air controlling their operation passes through a B&B Thermostat or Utilostat and acting on the damper motor diaphragm raises the lever which is connected to the dampers. When a thermostat or Utilostat on expansion shuts off the air to a damper motor the air pressure on the diaphragm is relieved and the lever moves in the opposite direction and closes or opens the dampers.



The sizes, serial numbers and weights of the B&B Line of Damper Motors are as follows:

Size	Serial No.	Weight
4½″	5075	9 lbs.
8″	5255	25 lbs.

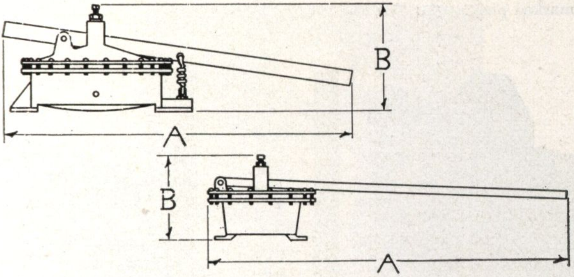
A B&B Damper Motor attached to a by-pass damper, located under a heater coil, is operated by a Utilostat, for tempering air. Attached to cut-off vent, or fresh air dampers, they may be controlled pneumatically by a three-way switch conveniently located. Such three-way switches may be located in any part of the building and will control dampers located in any part of the building.

The B&B Line of Multiflex Damper Motors

Specifications, Roughing-in and Performance Data

1. Body and cover of fine grained grey cast iron, accurately machined.
2. Diaphragm flange, stem and spring of high quality bronze suitable for this service.
3. Diaphragm, special bronze composition, corrugated and manufactured by the B&B process of making multiflex bellows and diaphragms.
4. Bolts, nuts, set screws and springs to the high standard of quality required by the B&B Line.
5. Lever, flat steel, smoothly finished, properly drilled, fulcrum pins accurately fitted.
6. All-metal construction, no rubber diaphragm and noiseless in its operation.

Roughing-in Dimensions



Size	A	B
4″	25″	6″
8″	25″	7½″,

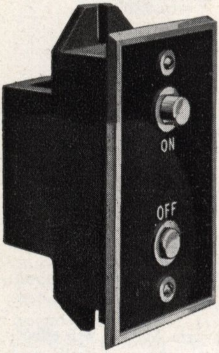
Performance: The B&B Multiflex Diaphragm Motors will effectively operate any and all types of ventilating dampers, wherever located, when properly connected to the damper lever arms, and when the multiflex damper motors are properly connected to pneumatically operated thermostats or utilostats, they are equally effective on a pneumatic system manually operated through three-way switches into the air controlling lines.

The B&B Line of Pneumatic Switches

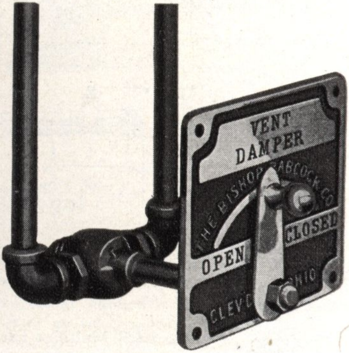
For the manual control of dampers through the operation of the B&B Line of Damper Motors, the B&B Line of Push-Button and Three-Way Pneumatic Switches are offered. The B&B Pneumatic Switches are ruggedly and accurately manufactured, are positive in their action, relieving air rapidly and completely when in the relief position, and operating without leakage when in the open position.

The B&B Line of Push-Button Pneumatic Switches are an all-brass construction, and are exceptionally heavy and durable. The case is furnished in frosted brass, with polished trim, or in full nickel plate. "ON" and "OFF" are legibly marked on the wall plate, raised letters being used.

The B&B Line of Three-Way Switches are an all-brass pneumatic three-way valve, with extended stem, the stem terminating in a squared end ingaging the hub of the indicating lever. The extended stem passes through a solid brass plate, plainly marked with the name of the damper under control by that particular switch, and with a plainly marked position for "OPEN" or "CLOSED."



Push-Button Switch



Three-Way Switch

The finish on these switches is supplied in any finish desired or to match that of the hardware in the room or rooms in which installed.

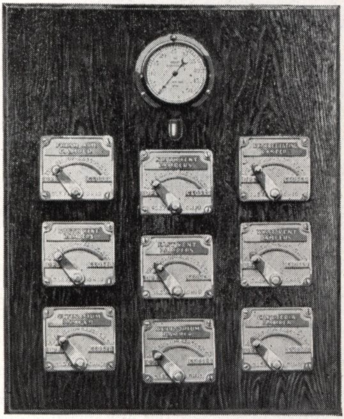
The B&B Line of Pneumatic Switches

Specifications, Roughing-in and Performance Data

1. The B&B Push-Button Switch is an all-brass pneumatic switch. Body and cover being heavy brass castings. Button frame a heavy brass casting, accurately machined.
2. The push-buttons are of brass rod accurately machined and fitted, and properly tensioned by brass snap springs.
3. The valves are large port valves, the operating stem moving up and down through port, preventing clogging by dust and dirt and self-cleaning.

1. The B&B Three-Way Switch is an all-brass valve, with extension stem, accurately machined and fitted.
2. Index plate solid brass casting, properly stamped "OPEN" and "CLOSED," and with name of damper or valves that they operate.
3. Lever solid brass, properly finished and fitted with finished lock nut to hold on squared end of the extension stem.
4. Valve equipped with ¼″ air pipe, properly proportioned and bent to standard curviture.

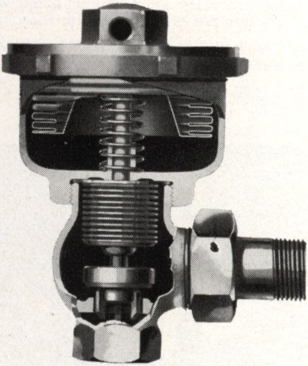
Both types of valves finished in any desired finish to match the hardware.



Performance: The B&B Push-Button or Three-Way Switch will positively control and operate damper motors located at distant points and where the pneumatic piping is tight and properly installed. The Three-Way Switch may be installed individually or in groups, and are accordingly conveniently mounted on the B&B Line of Boards, which is furnished in solid marble, in slate, or in hard wood. A dozen or more Three-Way Switches may be mounted on a board. A typical installation is shown in the above cut:

The B&B Line of Multiflex Pneumatic Valves

The B&B Line of Multiflex Pneumatic Valves are quick and accurate opening and closing valves used for regulation of heat entering radiators. Their action is governed by the thermostat or utilostat to which they may be connected, the use of which with the B&B Multiflex Pneumatic Valves gives an automatic temperature control system of the highest quality and greatest serviceability. The B&B Multiflex Pneumatic Valves are connected to a thermostat, either of the positive or graduate type by 1/8″ air piping, in which an operating pressure of 15 pounds is maintained by means of an air compressor.



Bishop & Babcock
Multiflex Pneumatic Valve

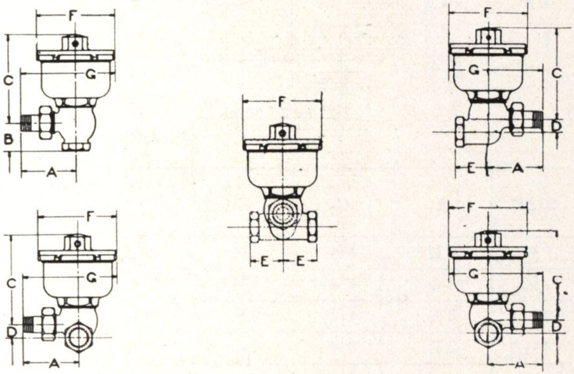
When a thermostat expands, due to heat, the air is automatically allowed to flow to the Multiflex pneumatic valve, and which, acting on the multiflex bellows therein, closes the valve tightly on its seat. Conversely when the thermostatic element contracts the air valve in the thermostat closes, exhausting the air, relieving the air pressure on the multiflex pneumatic valve, and opening the valve. In the graduate type, the operation is the same excepting that the valve in the pneumatic valve rises proportionally with that in the thermostat, namely is graduated as to the temperature.

The B&B Line of Pneumatic Valves

Specifications, Roughing-in and Performance Data

1. Body and cap of heavy steam metal castings, fully nickeled with polished trimmings.
2. Multiflex diaphragm made by the B&B process and giving a metal diaphragm possessing more corrugations than are found in any valve of equal size.
3. Multiflex bellows sweated to the head with block tin, a joint that is permanent.
4. The B&B Multiflex Packing, manufactured from special composition brass prevents the entrance of steam and water into the diaphragm chamber.
5. The valve stem projects through a free bronze washer, and its terminal spun over the valve body proper, integral with the multiflex packing.
6. The washer is locked into position between the body and the bonnet of the valve, thus forming a sealed air compartment, and impervious to steam and water.
7. There are no gaskets, all joints are metal to metal.
8. Valve disc holder fitted with the ball and socket joint, assuring of proper seating. Seats and discs are interchangeable and renewable.
9. These valves have extra high lift, are noisless in operation, are factory adjusted and tested and require no attention after installation.
10. The valve spring is located in the air compartment, cannot come in contact with steam or water, and a perfectly balanced valve results.
11. Swivel and nut of heavy brass castings are furnished with each valve, finished polished nickel.

Roughing-in Dimensions



½" to 2" Sizes

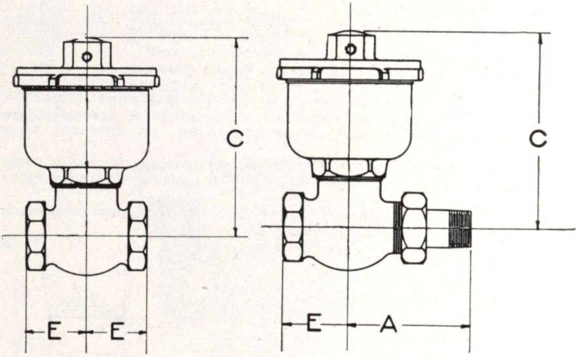
SIZE	A	B	C	D	E	F	G
½	2 11/16	1 3/8	4 7/16	21/32	1 5/8	3 7/8	4 5/8
¾	3	1 13/32	4 13/32	23/32	1 11/16	3 7/8	4 15/16
1	3 3/8	1 9/16	4 9/32	31/32	1 15/16	3 7/8	5 5/16
1¼	3 11/16	1 23/32	5 29/32	1	2 1/8	6	6 11/16
1½	4 11/32	2 ¼	5 15/16	—	—	6	7 11/32
2	4 ½	2 9/16	6 ¼	—	—	6	7 ½

Angle	R. H.	L. H.
10005	10025	10035
10055	10075	10085
10105	10125	10135
10155	10175	10185
10205		
10235		

The B&B Line of Pneumatic Valves

(Continued)

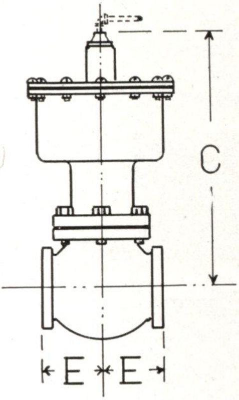
Roughing-in Measurements



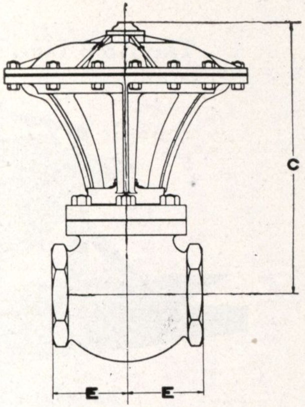
½" to 2" Sizes

SIZE	A	C	E	Serial Globe	Serial No. Globe Union
½	2 23/32	4⅞	1½	10045	10015
¾	3 5/32	4⅞	1⅝	10095	10065
1	3 7/16	4⅞	1¾	10145	10115
1¼	3 25/32	6½	2 1/16	10195	10165
1½	4½	6 15/16	2½	10225	10215
2	4 9/16	7 7/16	2⅞	10255	10245

Globe Pattern



2½″ to 5″ Sizes

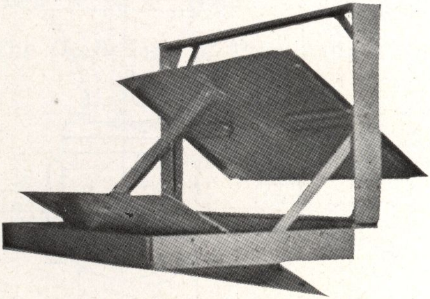


6″ to 10″ Size

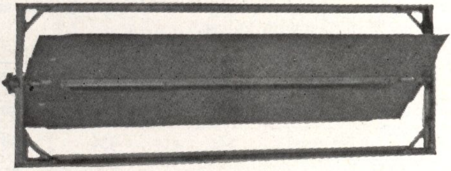
These valves are furnished either screwed or flanged, as specified. Flanges not furnished with Valves.

Size	Type	E	C	Serial No.
2½	Angle Screwed	3⅝	3⅝	8065
2½	Globe Screwed	3¾	3⅝	8075
3	Angle Screwed	4¼	5	8585
3	Angle Flanged	4¼	5	8085
3	Globe Screwed	3⅞	5	8575
3	Globe Flanged	3⅞	5	8095
3½	Angle Screwed	5⅛	20	5835-A
4	Globe Flanged	5⁹⁄₁₆	20½	5815-A
5	Globe Flanged	6⁹⁄₁₆	21½	5825-A
6	Globe Screwed	8	21¾	10325
6	Globe Flanged	7⅜	21¾	10335
7	Globe Screwed	8⁵⁄₁₆	22½	10345
7	Globe Flanged	7¾	22½	10355
8	Globe Screwed	9¹⁄₁₆	23¼	10365
8	Globe Flanged	8⁵⁄₁₆	23¼	10375
10	Globe Screwed	11	25¼	10385
10	Globe Flanged	10⁵⁄₁₆	25¼	10395

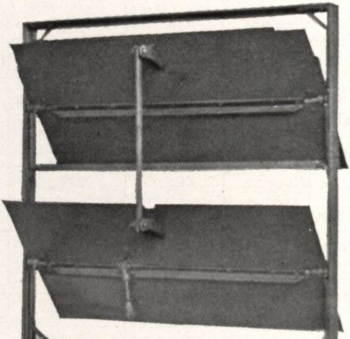
The B&B Line of Dampers



B&B Mixing Damper

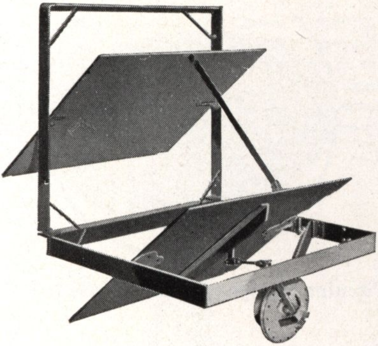


B&B Single Damper

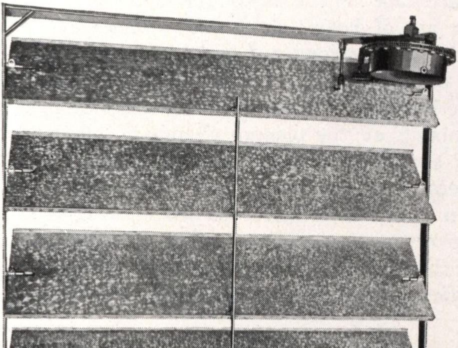


B&B Louvre Damper

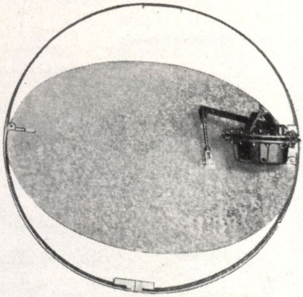
The B&B Line of Dampers



B&B Mixing Damper Motor Mounted Type



B&B Louvre Damper Motor Mounted Type

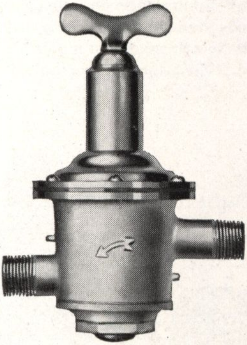


Circular Damper—Motor Mounted Type

The Bishop & Babcock Dampers, as illustrated on preceding pages are used with The Bishop & Babcock Temperature Control System. All our dampers are perfectly balanced and operated on brass trunnions so that accurate control is always assured. The damper blades are of heavy sheet steel. These blades are connected with a strong rod and assume parallel position under all operating conditions. With this arrangement the action of the intermediate thermostat insures proper mixing at the plenum chambers, at the fresh air inlets, at the by-pass inlets or at any point where our dampers are installed. This arrangement prevents sudden and unpleasant air changes in the rooms Moreover, at any angle at which the damper may be held, through the thermostat's intermediate action, predetermined air delivery will not be affected.

The B&B Line of Air Pressure Regulators

The B&B Air Pressure Regulator is used to reduce air pressure from the common 30 pounds pressure to the standard 15 pounds pressure carried in the piping system of a thermostatic or a manually operated temperature control system. The B&B Regulator is installed in the main air line after the air tank, and between the operating apparatus, thermostats, push-button switch, three-way switch, as the case may be.



Air Pressure Regulator

The sizes, serial numbers and weights of the B&B Line of Pressure Regulators are as follows:

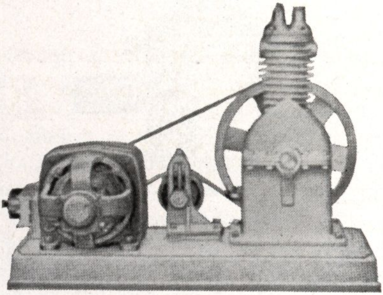
Type	Size	Serial No.	Weight Pounds
Air	⅛	457	1¼
Air	¼	467	1¼
Air	⅜	477	2
Air	½	1067	2

Air Regulator Specifications

1. All-brass construction, body and cap being heavy castings, accurately machined.
2. Diaphragm, spun bronze, provided with a bronze spring.
3. Adjusting nut and stud, high quality brass, accurately machined.
4. Assembly accurately tested and adjusted.

The B&B Line of Air Compressors

The B&B Line of Air Compressors is for use with temperature regulating systems. They may be belted to the ventilating fan shaft, and may be had with single tight pulley or equipped with tight and loose pulley. These compressors are simple in design and durably constructed. The B&B Automatic Switch stops the motor automatically when 30 pounds pressure is reached in the storage tank. After a drop of 7 pounds in this pressure the motor is automatically started and the tank refilled. No attention is required aside from an occasional oiling.



The compressor, equipped with a tight pulley only, is popular on heating installations, no belt shifter being required. When a desired pressure is reached in the storage tank, an automatic unloader permits air discharge to atmosphere, the compressor operating unloaded. A drop of 1 to 1½ pounds in the pressure in the tank causes the compressor automatically to pick up its load and function until the unloader discharges again.

The B&B Line of Air Compressor are compact, occupy small space and are dependable. The electrical type is mounted complete on a single bed plate motor belted to compressor.

Electric Air Compressors

Belt Driven with Idler

Stats	Size Inches	No. of Cylinders
Up to 20	1⅝x2	1
Up to 40	2⅛x2½	1
Up to 60	2½x3	1
Up to 80	2½x3	2
Up to 180	3 x3	2

Steam Driven Air Compressors

Furnished with Governor and all Accessories

Stats	Steam Cylinder	Air Cylinder	Stroke	Cu. Ft. Air Per Min.
Up to 35	3	3	3	2
Up to 45	4	3	5	3.2
Up to 60	4	4	5	5
Up to 75	4	4	6	6.5
Up to 90	5¼	4	7	7
Up to 150	5	5	6	10
Up to 200	4	6⅛	5	13
Up to 225	5	6⅛	6	14
Up to 300	5	7	6	20

Tank Sizes

For Electric and Steam Compressors

Up to 50 Thermostats= 30 gal. tank
Up to 75 Thermostats= 60 gal. tank
Up to 200 Thermostats=100 gal. tank

The B&B Line of Massachusetts Modified Squirrel Cage Fans

Application and Uses

Massachusetts Modified Squirrel Cage Fans are especially adapted for heating and ventilating systems in schools, public buildings, factories and mills; the ventilation of mines, subways, tunnels, drying systems and on board of ship. This type of fan is used for all classes of work formerly done by the steel plate (or paddle-wheel) type, but is not designed for moving materials such as shavings, wool, or grain, etc. Squirrel cage fans are made in standard sizes and capacities to meet every requirement for mechanical draft and for ventilation, whether or not in connection with heating.

Housing

The Housing is constructed of blue annealed open-hearth steel, strongly braced, bolted and riveted to a rigid frame of angle irons. The outlet is rectangular in shape and consists of angle irons bolted to the housing and arranged for connection to a discharge duct. The inlet is cone-shape and so constructed as to allow removal of the wheel from the housing.

Wheel

The fan wheel is designed to combine rigid construction and great strength with entrance to the blades free from obstruction. The blades are formed in dies. The resulting uniformity of thickness and weight gives the close balance necessary to prevent deflection, distortion or vibration at high speeds. The blades are securely riveted at both ends to annular rings. A few of the blades are slightly deeper than the rest, and these are attached to radial steel arms which are cast into the hub. The heavy spider on which the wheel is built is the deal construction for rigidity, strength and balance.

Shaft

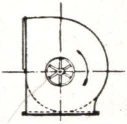
This is a steel forging or hot rolled carbon steel, depending upon the size, accurately turned and ground to size, keyseated for the hub of the wheel and for pulley or coupling.

Bearings

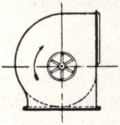
The bearings are extra long, of large diameters, self-oiling and self-aligning. They are of the ring-oiling type with large oil chambers. Bearings are lined with special babbitt metal accurately bored and reamed to size. For use under conditions requiring them, the bearings are water-cooled.

Squirrel Cage Fans can also be equipped with ball bearings or roller bearings to meet special conditions or specifications at a slight extra cost.

Designation of Rotation and Discharge Massachusetts Modified Squirrel Cage Fans



Counter-Clockwise
Top Horizontal



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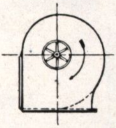

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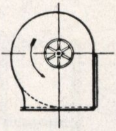

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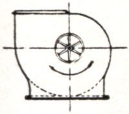
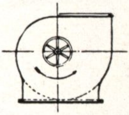


Clockwise
Up Blast



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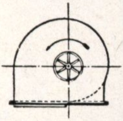
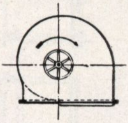
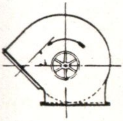
Up Blast



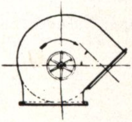
Counter-Clockwise
Down Blast



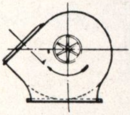
Clockwise
Down Blast



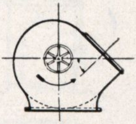
Counter-Clockwise
Top Angular Down



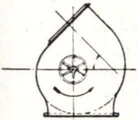
Clockwise
Top Angular Down



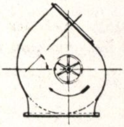
Clockwise
Bottom Angular Up



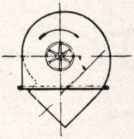
Counter-Clockwise
Bottom Angular Up



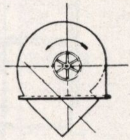
Counter-Clockwise
Top Angular Up



Clockwise
Top Angular Up



Clockwise
Bottom Angular Down



Counter-Clockwise
Bottom Angular Down

This method of designation applies to all centrifugal fans, single or double width, and single or double inlet.

Facing the driving side of a fan, blower or blast wheel if the proper direction of rotation is clockwise, the fan, blower or blast wheel will be designated as CLOCKWISE. If the proper direction of rotation is counter-clockwise the designation will be COUNTER-CLOCKWISE. (The driving side of a single inlet fan is considered to be the side opposite inlet regardless of the actual location of the drive).

The discharge of a fan is determined by the direction of the line of discharge and its relation to the fan shaft, as follows:

BOTTOM HORIZONTAL—If the line of discharge is horizontal and below the shaft.

TOP HORIZONTAL—If the line of discharge is horizontal and above the shaft.

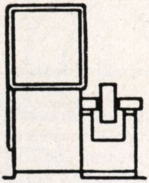
UP BLAST—If the line of air discharge is vertically up.

DOWN BLAST—If the line of air discharge is vertically down.

All intermediate discharge will be indicated as angular discharge as follows—Either top or bottom angular up discharge or top or bottom angular down discharge, the smallest angle made by the line of air discharge with the horizontal being specified. (See diagrams above.)

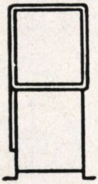
The B&B Line of Massachusetts Modified Squirrel Cage Fans

Standard Arrangements



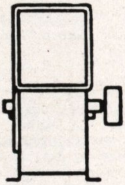
Arrangement 1—For Belt Drive

Wheel overhung, includes housing, wheel shaft, two bearings, pedestal and pulley.



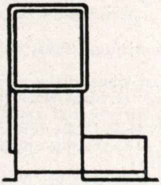
Arrangement 2—Direct Connection

Wheel overhung, includes housing and wheel only.



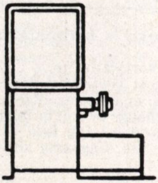
Arrangement 3—For Belt Drive

Pulley overhung, includes housing, wheel, shaft, two bearings and pulley.



Arrangement 4—For Direct Connection

Wheel overhung on engine or motor shaft, includes housing, wheel and base.



Arrangement 5—Direct Connections

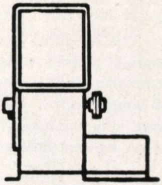
Includes housing, wheel, shaft, bearing on drive side of fan, flanged coupling and base.

The B&B Line of Massachusetts Modified Squirrel Cage Fans

Standard Arrangements

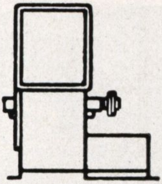
Arrangement 6—Direct Connection

Includes housing, wheel, shaft, bearing in fan inlet, flanged coupling and base.



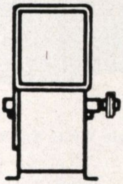
Arrangement 7—Direct Connection

Includes housing, wheel, shaft, two bearings flexible coupling and base.



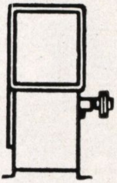
Arrangement 8—Direct Connection

Includes housing, wheel, shaft, two bearings, and flexible coupling.



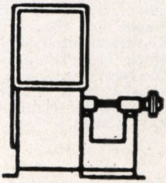
Arrangement 9—Direct Connection

Wheel overhung, includes housing, wheel, shaft, one bearing on drive side and flanged coupling.



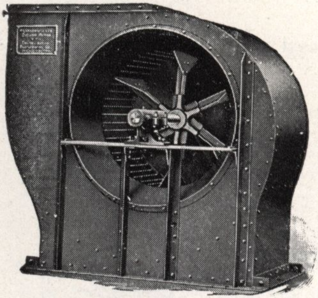
Arrangement 10—Direct Connection

Wheel overhung, includes housing, wheel shaft, two bearings, pedestal and flexible coupling.



The B&B Line of Massachusetts Modified Squirrel Cage Fans

The Modified Squirrel Cage Fan is made single width, single inlet, when it is used as an exhauster. When used as a blower, fans ranging from size No. 1½ and up can be equipped with two inlets with housing of single width. Fans with two inlets have a different characteristic from single inlet as the tip speed will average about 5% lower for a given volume and pressure.

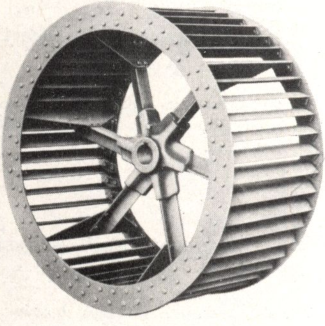


Single Width Squirrel Cage Fan

A double width, double inlet squirrel cage fan will deliver approximately twice the volume of air of a single width fan at the same pressure and tip speed, and require twice the power. This type of fan can be used to advantage particularly where head room is limited.

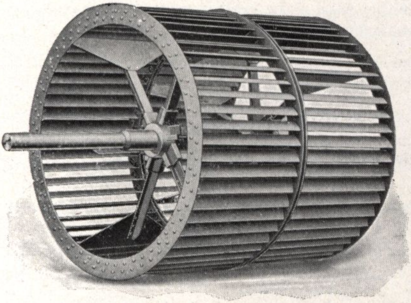
Wheel

The fan wheel is designed to combine rigid construction and great strength with entrance to the blades free from obstruction. The blades are formed in dies. The resulting uniformity of thickness and weight gives the close balance necessary to prevent deflection, distortion or vibration at high speeds. The blades are securely riveted at both ends to annular rings. A few of the blades are slightly deeper than the rest, and these are attached to radial steel arms which are cast into the hub. The heavy spider on which the wheel is built is the ideal construction for rigidity, strength and balance.



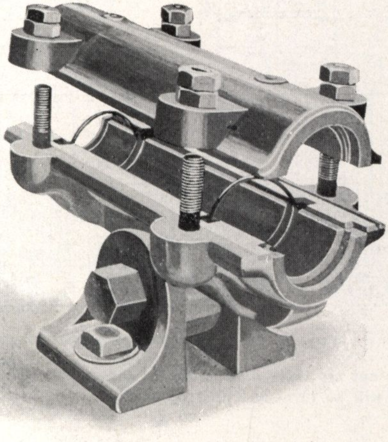
The B&B Line of Massachusetts Modified Squirrel Cage Fans

The housings are built of open-hearth steel, of proper weight, rigidly braced and bolted and riveted to angle iron frames. Housings are of such proportion to give the highest efficiency in delivery of air.



Fan Wheel for Double Width Fan

The bearings are extra long and of large diameter, self-oiling and self-aligning. They are of the double ring oiling type and are provided with a large oil reservoir. The linings are of the best quality babbitt, accurately bored and reamed to size, and under special conditions, water cooling is provided for.



The B&B Line of Massachusetts Modified Squirrel Cage Fans

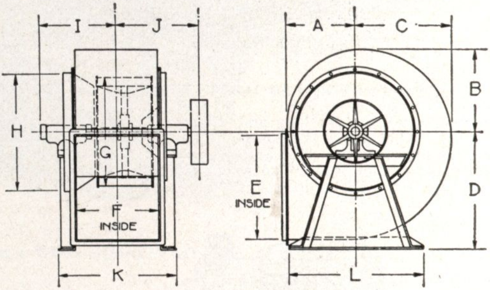
The universal type of fan has many advantages, as same can be adapted to either hand and a great number of discharges, being readily interchangeable by removing a series of bolts.

Up to size No. 3 inclusive, fans of the universal type will be furnished unless otherwise requested.

Outline of Universal Type Fan

Single Width No. 1½ to No. 3 inclusive—Single Inlet

Universal Squirrel Cage Fan—Arrangement "A"



SIZE	A	B	C	D	E	F	G	H	I	J	K	L	Shaft Dia.	Pulley	
														Dia.	Face
1½	11⅜	13⅝	15⅞	20¼	17⅝	13⅞	18	19	14⅜	15½	20½	23½	1 7/16	10	4
1¾	13⅜	16	18⅝	23½	20⅝	16⅛	21	23	15½	16¾	24⅝	27	1 7/16	12	4
2	15¼	18¼	21¼	26¼	23½	18½	24	26	17	18⅞	26⅝	32	1 11/16	14	4
2¼	17⅛	20½	23⅞	29¾	26½	20¾	27	29	19	21⅛	28⅞	38	1 15/16	16	4
2½	19	22¾	26½	32¾	29⅜	23⅛	30	32	20¼	21¾	33⅛	39	1 15/16	18	4
2¾	21	25⅛	29¼	35½	32⅜	25⅜	33	35	22	24	35⅜	44	2 3/16	20	6
3	22⅞	27⅜	31⅞	38½	35¼	27¾	36	38	23	25¼	37¾	44½	2 3/16	22	6

All dimensions are in inches.

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

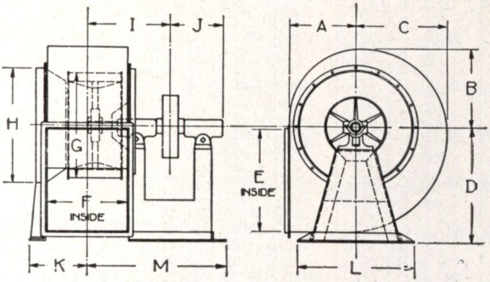
The B&B Line of Massachusetts Modified Squirrel Cage Fans

Squirrel cage fans size No. 3½ and larger are made only in standard type. Single inlet fans are constructed with either pulley or overhung wheel. Single width fans can be furnished with double inlet.

Outline of Universal Type Fan

Single Width, No. 1½ to No. 3, inclusive, Single Inlet

Universal Squirrel Cage Fan—Arrangement "B"



SIZE	A	B	C	D	E	F	G	H	I	J	K	L	M	Shaft Dia.	Pulley Dia.	Pulley Face
1¼	9½	11⅜	13¼	17⅛	14 11/16	11 9/16	15	16	14 3/16	9 9/16	8	20	24 3/16	1 5/16	8	4
1½	11⅜	13⅝	15⅞	20¼	17⅝	13⅞	18	19	16⅛	10⅞	9⅞	22½	27⅜	1 7/16	10	4
1¾	13⅜	16	18⅝	23½	20⅝	16⅛	21	23	17 5/16	10 15/16	11	24¼	28⅝	1 7/16	12	4
2	15¼	18¼	21¼	26¼	23½	18½	24	26	19 3/16	12¼	12 11/16	26⅝	31 11/16	1 11/16	14	4
2¼	17⅛	20½	23⅞	29¾	26½	20¾	27	29	21¼	13½	14	30¾	35⅝	1 15/16	16	4
2½	19	22¾	26½	32¾	29⅜	23⅛	30	32	22 7/16	13½	15 11/16	32¾	37 5/16	1 15/16	18	4
2¾	21	25⅛	29¼	35½	32⅜	25⅜	33	35	25 1/16	15½	16 13/16	35¼	41 3/16	2 3/16	20	6
3	22⅞	27⅜	31⅞	38½	35¼	27¾	36	38	26¾	15½	18	35⅝	43⅜	2 7/16	22	6

All dimensions are in inches.

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

The B&B Line of Massachusetts Modified Squirrel Cage Fans

Capacities—Speeds—Horsepowers

Air at 65 degrees, Fahrenheit, Density being .075

Size	Dia. Wheels Inches	Static Press. Inches W. G.	⅛	¼	⅜	½	⅝	¾
		P. V.	1200	1800	2100	2350	2700	2900
1½	18	C.F.M.	1470	2360	2640	2890	3370	3600
		R.P.M.	256	381	445	499	573	616
		B.H.P.	.08	.26	.41	.54	.84	1.02
1¾	21	C.F.M.	2000	3210	3600	3940	4590	4900
		R.P.M.	220	327	382	428	492	528
		B.H.P.	10	.36	.56	.74	1.15	1.39
2	24	C.F.M.	2610	4180	4700	5150	6000	6390
		R.P.M.	192	286	334	374	430	462
		B.H.P.	.13	.47	.73	.97	1.50	1.81
2¼	27	C.F.M.	3300	5300	5950	6510	7590	8100
		R.P.M.	171	254	297	332	382	411
		B.H.P.	.17	.59	.92	1.22	1.90	2.30
2½	30	C.F.M.	4080	6550	7340	8050	9370	9990
		R.P.M.	154	229	267	299	344	370
		B.H.P.	.21	.73	1.13	1.51	2.35	2.84
2¾	33	C.F.M.	4930	7910	8880	9730	11350	12100
		R.P.M.	140	208	243	272	313	336
		B.H.P.	.25	.88	1.37	1.82	2.84	3.44
3	36	C.F.M.	5880	9420	10550	11600	13500	14400
		R.P.M.	128	191	223	250	287	307
		B.H.P.	.30	1.05	1.63	2.17	3.38	4.10
3½	42	C.F.M.	8000	12800	14400	15800	18400	19600
		R.P.M.	110	163	191	214	246	264
		B.H.P.	.41	1.43	2.22	2.96	4.60	5.57
4	48	C.F.M.	10450	16750	18800	20600	24000	25550
		R.P.M.	96	143	167	187	215	231
		B.H.P.	.53	1.87	2.90	3.86	6.00	7.25
4½	54	C.F.M.	13200	21200	23800	26100	30400	32400
		R.P.M.	85	127	148	166	191	205
		B.H.P.	.67	2.37	3.67	4.89	7.60	9.20
5	60	C.F.M.	16300	26200	29400	32200	37500	40000
		R.P.M.	77	114	134	150	172	185
		B.H.P.	.83	2.93	4.54	6.04	9.38	11.4
5½	66	C.F.M.	19750	31700	35500	38900	45400	48300
		R.P.M.	70	104	122	136	156	168
		B.H.P.	1.00	3.54	5.48	7.29	11.3	13.7
6	72	C.F.M.	23500	37700	42300	46300	54000	57500
		R.P.M.	64	95	111	125	143	154
		B.H.P.	1.19	4.21	6.53	8.68	13.5	16.3
6½	78	C.F.M.	27600	44200	49600	54400	63400	67500
		R.P.M.	59	88	103	115	132	142
		B.H.P.	1.40	4.94	7.65	10.2	15.9	19.2
7	84	C.F.M.	32000	51300	57600	63000	73500	78300
		R.P.M.	55	82	96	107	123	132
		B.H.P.	1.62	5.73	8.89	11.9	18.4	22.3
7½	90	C.F.M.	36800	58900	66100	72500	84500	90000
		R.P.M.	51	76	89	100	115	123
		B.H.P.	1.86	6.58	10.2	13.6	21.1	25.6
8	96	C.F.M.	41800	67000	75100	82400	96000	102000
		R.P.M.	48	72	84	94	108	116
		B.H.P.	2.12	7.49	11.6	15.4	24.0	29.0

The B&B Line of Massachusetts Modified Squirrel Cage Fans

Capacities—Speeds—Horsepowers

Air at 65 Degrees Fahrenheit, Density being .075

Size	Dia. Wheels Inches	Static Press. Inches W. G.	1	1¼	1½	2	2½
		P. V.	3300	3700	4100	4900	5300
1½	18	C.F.M.	3940	4480	5050	6230	6550
		R.P.M.	701	787	870	1040	1125
		B.H.P.	1.48	2.11	2.86	5.21	6.34
1¾	21	C.F.M.	5360	6100	6870	8470	8900
		R.P.M.	601	675	746	892	964
		B.H.P.	2.01	2.88	3.89	7.06	8.60
2	24	C.F.M.	7000	7950	9000	11100	11650
		R.P.M.	526	590	652	780	844
		B.H.P.	2.63	3.75	5.09	9.28	11.3
2¼	27	C.F.M.	8850	10100	11350	14000	14700
		R.P.M.	468	524	580	694	750
		B.H.P.	3.32	4.76	6.42	11.7	14.2
2½	30	C.F.M.	10900	12400	14050	17300	18200
		R.P.M.	421	472	522	624	675
		B.H.P.	4.09	5.85	7.95	14.5	17.6
2¾	33	C.F.M.	13200	15100	16900	20900	22000
		R.P.M.	383	429	475	568	614
		B.H.P.	4.96	7.11	9.56	17.5	21.3
3	36	C.F.M.	15750	17900	20200	24900	26200
		R.P.M.	351	394	435	520	562
		B.H.P.	5.91	8.43	11.4	20.8	25.3
3½	42	C.F.M.	21400	24400	27500	33900	35700
		R.P.M.	301	337	372	446	482
		B.H.P.	8.04	11.5	15.6	28.3	34.5
4	48	C.F.M.	28000	31850	35900	44250	46550
		R.P.M.	263	295	326	390	422
		B.H.P.	10.5	15.0	20.3	37.0	45.0
4½	54	C.F.M.	35400	40300	45500	56000	59000
		R.P.M.	234	262	290	347	375
		B.H.P.	13.3	19.0	25.7	46.8	57.1
5	60	C.F.M.	43700	49800	56100	69200	73000
		R.P.M.	211	236	261	312	337
		B.H.P.	16.4	23.4	31.7	57.9	70.6
5½	66	C.F.M.	53000	60500	68000	83800	88000
		R.P.M.	191	214	237	284	307
		B.H.P.	19.9	28.5	38.5	70.0	85.1
6	72	C.F.M.	63000	71800	80900	99600	105000
		R.P.M.	175	197	217	260	281
		B.H.P.	23.6	33.8	45.8	83.2	102.0
6½	78	C.F.M.	74000	84200	95000	117000	123000
		R.P.M.	162	181	201	240	260
		B.H.P.	27.8	39.6	53.7	98.0	119.0
7	84	C.F.M.	85900	97600	110000	135500	143000
		R.P.M.	150	169	186	223	241
		B.H.P.	32.3	46.0	63.0	113.0	138.0
7½	90	C.F.M.	98500	112000	126500	156000	164000
		R.P.M.	140	157	174	208	225
		B.H.P.	37.0	52.7	71.6	130.0	159.0
8	96	C.F.M.	112000	127500	143500	177000	187000
		R.P.M.	132	148	163	195	211
		B.H.P.	42.1	60.0	81.2	148.0	181.0

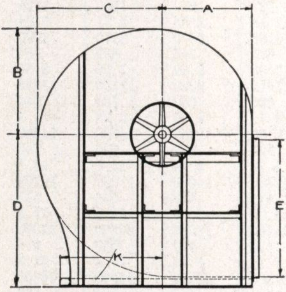
The B&B Line of Massachusetts Modified Squirrel Cage Fans

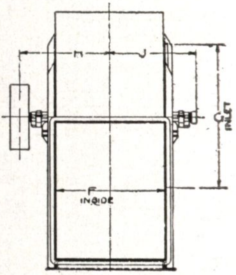
Principal Dimensions

in Inches

Full Housed Bottom Horizontal Discharge

Single Width **Single Inlet**





Size	Shaft	Wheel	A	B	C	D	E	F	G	H	J	K	Pulley
*1½	1 5/16	18	11⅜	13⅝	15⅞	20⅝	17⅝	13⅞	19	14¾	13⅛	16¼	10x 4
*1¾	1 7/16	21	13⅜	16	18⅜	23¾	20⅝	16⅛	22	16½	14⅞	18⅝	12x 4
*2	1 11/16	24	15¼	18¼	21¼	26¾	23½	18½	26	18¼	16⅝	20¼	14x 4
*2¼	1 15/16	27	17⅛	20½	23⅞	29¾	26½	20¾	29	20½	19	21¾	16x 4
*2½	1 15/16	30	19	22¾	26½	32¾	29⅜	23⅛	32	21¼	20¼	23¼	18x 4
*2¾	2 3/16	33	21	25⅛	29¼	35⅞	32⅜	25⅜	35	24½	21⅞	25¼	20x 6
*3	2 3/16	36	22⅞	27⅜	31⅞	39⅜	35¼	27¾	38	25⅝	23	27¼	22x 6
3½	2 7/16	42	26¾	32	37¼	45½	41⅛	32⅜	44	28½	25⅞	30¾	24x 6
4	2 11/16	48	30½	36½	42½	52	47	37	50	31⅞	29¼	34¼	28x 6
4½	2 15/16	54	34¼	41	47¾	58	52⅞	41⅝	56	34⅞	32¼	37¼	30x 6
5	3 3/16	60	38⅛	45⅝	53⅛	64⅛	58¾	46¼	62	38¾	35⅝	42¾	36x 8
5½	3 7/16	66	42	50¼	58½	70¼	64⅝	50⅞	68	41⅞	38¾	45¾	40x 8
6	3 15/16	72	45¾	54¾	63¾	76¼	70½	55½	74	45⅞	41¾	48¾	44x 8
6½	4 7/16	78	49½	59¼	69	82¼	76⅜	60⅛	80	50	47¼	52¼	48x 8
7	4 15/16	84	53⅜	63⅞	74⅜	89⅜	82¼	64¾	86	54½	51½	56¼	52x10
7½	4 15/16	90	57¼	68½	79¾	95½	88⅛	69⅜	92	56⅞	53⅞	59¼	56x10
8	5½	96	61	73	85	101½	94	74	98	60⅞	58⅛	62¼	60x10

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

*No. 1½ to No. 3, inclusive, are regularly built Universal type, but can be built to suit requirements.

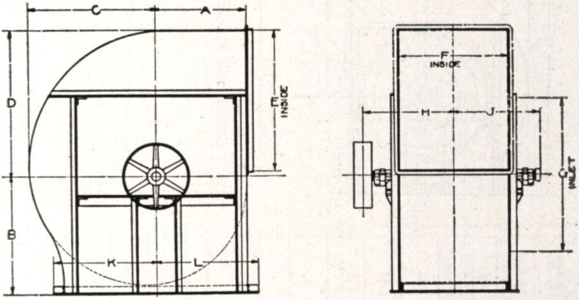
The B&B Line of Massachusetts Modified Squirrel Cage Fans

Principal Dimensions

in Inches

Full Housed Top Horizontal Discharge

Single Width **Single Inlet**



Size	Shaft	Wheel	A	B	C	D	E	F	G	H	J	K	L	Pulley
*1½	1 5/16	18	11⅜	16⅛	15⅞	18⅛	17⅝	13⅞	19	14¾	13⅛	16¾	11⅜	10x 4
*1¾	1 7/16	21	13⅜	18½	18⅝	21¼	20⅝	16⅛	22	16½	14⅞	18¼	13⅜	12x 4
*2	1 11/16	24	15¼	20¾	21¼	24¼	23½	18½	26	18¼	16⅝	20¼	18⅜	14x 4
*2¼	1 15/16	27	17⅛	23	23⅞	27¼	26½	20¾	29	20½	19	21¾	20¼	16x 4
*2½	1 15/16	30	19	25¼	26½	30¼	29⅜	23⅛	32	21¼	20¼	23¼	22⅛	18x 4
*2¾	2 3/16	33	21	27⅝	29¼	33⅜	32⅜	25⅜	35	24½	21⅞	25¼	24⅛	20x 6
*3	2 3/16	36	22⅞	30⅜	31⅞	36⅜	35¼	27¾	38	25⅝	23	27¼	26½	22x 6
3½	2 7/16	42	26¾	35	37¼	42½	41⅛	32⅜	44	28½	25⅞	30¾	30⅜	24x 6
4	2 11/16	48	30½	40	42½	48½	47	37	50	31⅞	29¼	34¼	34⅝	28x 6
4½	2 15/16	54	34¼	44½	47¾	54½	52⅞	41⅝	56	34⅞	32¼	37¼	38⅜	30x 6
5	3 3/16	60	38⅛	49⅛	53⅛	60⅝	58¾	46¼	62	38¾	35⅝	42¾	43¼	36x 8
5½	3 7/16	66	42	53¾	58½	66¾	64⅝	50⅞	68	41⅞	38¾	45¾	47⅛	40x 8
6	3 15/16	72	45¾	58¼	63¾	72¾	70½	55½	74	45⅞	41¾	48¾	50⅞	44x 8
6½	4 7/16	78	49½	62¾	69	78¾	76⅜	60⅛	80	50	47¼	52¼	54⅝	48x10
7	4 15/16	84	53⅜	68⅜	74⅜	84⅞	82¼	64¾	86	54½	51½	56¼	59½	52x10
7½	4 15/16	90	57¼	73	79¾	91	88⅛	69⅜	92	56⅞	53⅞	59¼	63⅜	56x10
8	5½	96	61	77½	85	97	94	74	98	60⅞	58⅛	62¼	67⅛	60x10

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

*No. 1½ to No. 3, inclusive, are regularly built Universal type, but can be built to suit requirements.

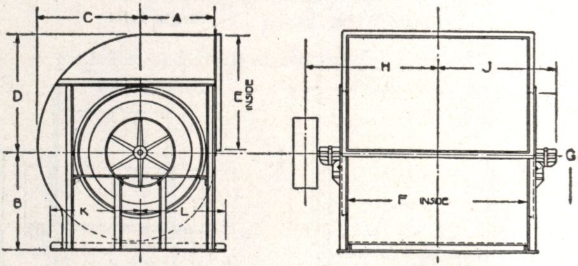
The B&B Line of Massachusetts Modified Squirrel Cage Fans

Principal Dimensions

in Inches

Full Housed Top Horizontal Discharge

Double Width **Double Inlet**



SIZE	Shaft at Center	Size of Bearing	Wheel	A	B	C	D	E	F	G	H	J	K	L	Pulley
1½	1 11/16	1 7/16	18	11⅜	16⅛	15⅞	18⅛	17⅝	27¾	19	22	19¼	16¾	14	10x 6
1¾	1 15/16	1 7/16	21	13⅜	18½	18⅝	21¼	20⅝	32¼	23	25	21½	18¼	16	12x 6
2	2 3/16	1 11/16	24	15¼	20¾	21¼	24¼	23½	37	26	28	24½	20¼	18⅜	14x 6
2¼	2 7/16	1 15/16	27	17⅛	23	23⅞	27¼	26½	41½	29	31½	28	21¾	20¼	16x 6
2½	2 7/16	1 15/16	30	19	25¼	26½	30¼	29⅜	46¼	32	34	30¼	23¼	22⅛	18x 6
2¾	2 11/16	2 3/16	33	21	27⅝	29¼	33⅜	32⅜	50¾	35	38	33	25¼	24⅛	20x 8
3	2 15/16	2 3/16	36	22⅞	30⅜	31⅞	36⅜	35¼	55½	38	40¼	35½	27¼	26½	22x 8
3½	3 3/16	2 7/16	42	26¾	35	37¼	42½	41⅛	64¾	44	45½	40½	30¾	30⅜	24x 8
4	3 7/16	2 11/16	48	30½	39½	42½	48½	47	74	50	51¼	46¼	34¼	34⅛	28x 8
4½	3 15/16	2 15/16	54	34¼	44	47¾	54½	52⅞	83¼	56	56½	51½	37¼	37⅞	30x 8
5	4 7/16	3 3/16	60	38⅛	49⅛	53⅛	60⅝	58¾	92½	62	63¼	57¼	42¾	42¼	36x10
5½	4 15/16	3 7/16	66	42	53¾	58½	66¾	64⅝	101¾	68	68½	62½	45¾	46⅛	40x10
6	5½	3 15/16	72	45¾	58¼	63¾	72¾	70½	111	74	74¾	69	48¾	50⅞	44x10
6½	6	4 7/16	78	49½	62¾	69	78¾	76⅜	120¼	80	81¼	75¼	52¼	54⅝	48x10
7	6¾	4 15/16	84	53⅜	67⅜	74⅜	84⅞	82¼	129½	86	87⅞	81⅝	56¼	59½	52x12
7½	7½	4 15/16	90	57¼	72	79¾	91	88⅛	138¾	92	92½	86¼	59¼	63⅜	56x12
8	8	5½	96	61	77½	85	97	94	148	98	98⅞	92⅞	62¼	67⅛	60x12

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

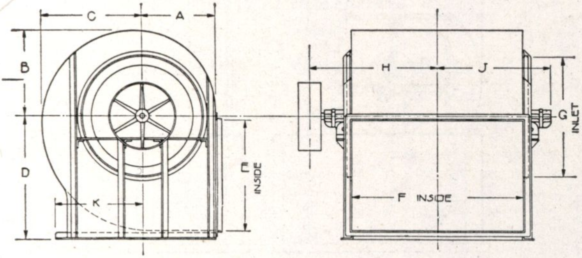
The B&B Line of Massachusetts Modified Squirrel Cage Fans

Principal Dimensions

in Inches

Full Housed Bottom Horizontal Discharge

Double Width **Double Inlet**



SIZE	Shaft at Center	Size of Bearing	Wheel	A	B	C	D	E	F	G	H	J	K	Pulley
1½	1 11/16	1 7/16	18	11⅜	13⅝	15⅞	20⅝	17⅝	27¾	19	22	19¼	16¾	10x 6
1¾	1 15/16	1 7/16	21	13⅜	16	18⅝	23¾	20⅝	32¼	23	25	21½	18¼	12x 6
2	2 3/16	1 11/16	24	15¼	18¼	21¼	26¾	23½	37	26	28	24½	20¼	14x 6
2¼	2 7/16	1 15/16	27	17⅛	20½	23⅞	29¾	26½	41½	29	31½	28	21¾	16x 6
2½	2 7/16	1 15/16	30	19	22¾	26½	32¾	29⅜	46¼	32	34	30¼	23¼	18x 6
2¾	2 11/16	2 3/16	33	21	25⅛	29¼	35⅞	32⅜	50¾	35	38	33	25¼	20x 8
3	2 15/16	2 3/16	36	22⅞	27⅜	31⅞	39⅜	35¼	55½	38	40¼	35½	27¼	22x 8
3½	3 3/16	2 7/16	42	26¾	32	37¼	45½	41⅛	64¾	44	45½	40½	30¾	24x 8
4	3 7/16	2 11/16	48	30½	36½	42½	51½	47	74	50	51¼	46¼	34¼	28x 8
4½	3 15/16	2 15/16	54	34¼	41	47¾	57½	52⅞	83¼	56	56½	51½	37¼	30x 8
5	4 7/16	3 3/16	60	38⅛	45⅝	53⅛	64⅛	58¾	92½	62	63¼	57¼	42¾	36x10
5½	4 15/16	3 7/16	66	42	50¼	58½	70¼	64⅝	101¾	68	68½	62½	45¾	40x10
6	5½	3 15/16	72	45¾	54¾	63¾	76¼	70½	111	74	74¾	69	48¾	44x10
6½	6	4 7/16	78	49½	59¼	69	82¼	76⅜	120¼	80	81¼	75¼	52¼	48x10
7	6¾	4 15/16	84	53⅜	63⅞	74⅜	89⅜	82¼	129½	86	87⅞	81⅝	56¼	52x12
7½	7½	4 15/16	90	57¼	68½	79¾	95½	88⅛	138¾	92	92½	86¼	59¼	56x12
8	8	5½	96	61	73	85	101½	94	148	98	98⅞	92⅞	62¼	60x12

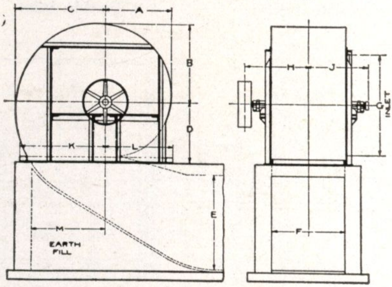
Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

The B&B Line of Massachusetts Modified Squirrel Cage Fans

Principal Dimensions
in Inches

7-8 Housed Bottom Horizontal Discharge

Single Width **Single Inlet**



SIZE	Shaft	Wheel	A	B	C	D	E	F	G	H	J	K	L	M	Pulley
1½	1 5/16	18	12⅛	14⅜	16⅝	12⅜	17⅝	13⅜	19	14¾	13⅛	16¾	16	13¾	10x 4
1¾	1 7/16	21	14¼	16⅞	19½	14⅛	20⅝	15⅝	22	16½	14⅞	19¼	17½	16⅛	12x 4
2	1 11/16	24	16¼	19¼	22¼	15¾	23½	18	26	18¼	16⅝	24½	20½	18⅜	14x 4
2¼	1 15/16	27	18¼	21⅝	25	17⅜	26½	20¼	29	20½	19	25½	22	20½	16x 4
2½	1 15/16	30	20¼	24	27¾	19	29⅜	22⅝	32	21¼	20¼	26⅞	23	23	18x 4
2¾	2 3/16	33	22⅜	26½	30⅝	20¾	32⅜	24⅞	35	24½	21⅞	29⅜	25	25¼	20x 6
3	2 3/16	36	24⅜	28⅞	33⅜	22⅞	35¼	27¼	38	25⅝	23	32¼	27	27½	22x 6
3½	2 7/16	42	28¼	33¾	39	26¼	41⅛	31⅞	44	28½	25⅞	37⅛	30½	32⅛	24x 6
4	2 11/16	48	32½	38½	44½	29⅞	47	36⅜	50	31⅞	29¼	42	34	36⅝	28x 6
4½	2 15/16	54	36¾	43⅛	49⅞	33¼	52⅞	41	56	34⅞	32¼	47⅛	37	41¼	30x 6
5	3 3/16	60	40½	48	55½	36½	58¾	45½	62	38¾	35⅝	53⅛	42½	45⅞	36x 8
5½	3 7/16	66	44⅝	52⅞	61⅛	39⅞	64⅝	50⅛	68	41⅞	38¾	58	45½	50⅜	40x 8
6	3 15/16	72	48⅝	57⅝	66⅝	43⅛	70½	54¾	74	45⅞	41¾	62⅝	48½	55	44x 8
6½	4 7/16	78	52⅝	62⅜	72⅛	46⅜	76⅜	59⅜	80	50	47¼	67½	52	59½	48x 8
7	4 15/16	84	56¾	67¼	77¾	50¾	82¼	64	86	54½	51½	73⅜	56	64¼	52x10
7½	4 15/16	90	60⅞	72⅛	83⅜	54⅛	88⅛	68⅝	92	56⅞	53⅞	78⅛	59	68¾	56x10
8	5½	96	64⅞	76⅞	88⅞	57⅜	94	73¼	98	60⅞	58⅛	83	62	73¼	60x10

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

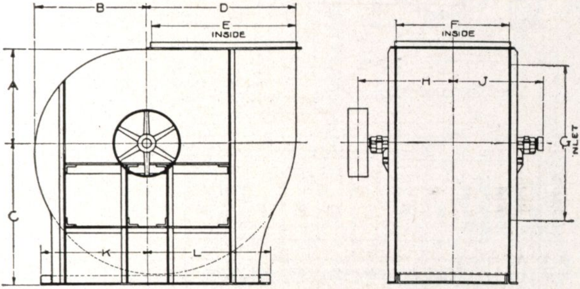
The B&B Line of Massachusetts Modified Squirrel Cage Fans

Principal Dimensions

in Inches

Full Housed Top Vertical Discharge

Single Width **Single Inlet**



SIZE	Shaft	Wheel	A	B	C	D	E	F	G	H	J	K	L	Pulley
*1½	1 5/16	18	11⅜	13⅝	18⅜	18⅛	17⅝	13⅞	19	14¾	13⅛	16¾	16¼	10x 4
*1¾	1 7/16	21	13⅜	16	21⅛	21¼	20⅝	16⅛	22	16½	14⅞	18¼	18⅝	12x 4
*2	1 11/16	24	15¼	18¼	23¾	24¼	23½	18½	26	18¼	16⅝	20¼	23½	14x 4
*2¼	1 15/16	27	17⅛	20½	26⅜	27¼	26½	20¾	29	20½	19	21¾	24	16x 4
*2½	1 15/16	30	19	22¾	29	30¼	29⅜	23⅛	32	21¼	20¼	23¼	27	18x 4
*2¾	2 3/16	33	21	25⅛	31¾	33⅜	32⅜	25⅜	35	24½	21⅞	25¼	28	20x 6
*3	2 3/16	36	22⅞	27⅜	34⅞	36⅜	35¼	27¾	38	25⅝	23	27¼	30	22x 6
3½	2 7/16	42	26¾	32	40¼	42½	41⅛	32⅜	44	28½	25⅞	30¾	34¾	24x 6
4	2 11/16	48	30½	36½	46	48½	47	37	50	31⅞	29¼	34¼	40¼	28x 6
4½	2 15/16	54	34¼	41	51¼	54½	52⅞	41⅝	56	34⅞	32¼	37¼	44¼	30x 6
5	3 3/16	60	38⅛	45⅝	56⅝	60⅝	58¾	46¼	62	38¾	35⅝	42¾	49	36x 8
5½	3 7/16	66	42	50¼	62	66¾	64⅝	50⅞	68	41⅞	38¾	45¾	52¾	40x 8
6	3 15/16	72	45¾	54¾	67¼	72¾	70½	55½	74	45⅞	41¾	48¾	57	44x 8
6½	4 7/16	78	49½	59¼	72½	78¾	76⅜	60⅛	80	50	47¼	52¼	61¾	48x 8
7	4 15/16	84	53⅜	63⅞	78⅞	84⅞	82¼	64¾	86	54½	51½	56¼	67½	52x10
7½	4 15/16	90	57¼	68½	84¼	91	88⅛	69⅜	92	56⅞	53⅞	59¼	71¾	56x10
8	5½	96	61	73	89½	97	94	74	98	60⅞	58⅛	62¼	75¾	60x10

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

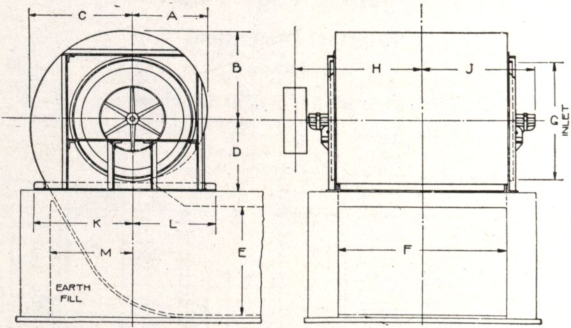
*No. 1½ to No. 3, inclusive, are regularly built Universal type, but can be built to suit requirements.

The B&B Line of Massachusetts Modified Squirrel Cage Fans

Principal Dimensions in Inches

7-8 Housed Bottom Horizontal Discharge

Double Width **Double Inlet**



SIZE	Shaft at Center	Size of Bearing	Wheel	A	B	C	D	E	F	G	H	J	K	L	M	Pulley
1 1/2	1 11/16	1 7/16	18	12 1/8	14 3/8	16 5/8	12 3/8	17 5/8	27 3/4	19	22	19 1/4	16 3/4	16	13 3/4	10x 6
1 3/4	1 15/16	1 7/16	21	14 1/4	16 7/8	19 1/2	14 1/8	20 5/8	32 1/4	23	25	21 1/2	19 1/4	17 1/2	16 1/8	12x 6
2	2 3/16	1 11/16	24	16 1/4	19 1/4	22 1/4	15 3/4	23 1/2	37	26	28	24 1/2	24 1/2	20 1/2	18 3/8	14x 6
2 1/4	2 7/16	1 15/16	27	18 1/4	21 5/8	25	17 3/8	26 1/2	41 1/2	29	31 1/2	28	25 1/2	22	20 1/2	16x 6
2 1/2	2 7/16	1 15/16	30	20 1/4	24	27 3/4	19	29 3/8	46 1/4	32	34	30 1/4	26 7/8	23	23	18x 6
2 3/4	2 11/16	2 3/16	33	22 3/8	26 1/2	30 5/8	20 3/4	32 3/8	50 3/4	35	38	33	29 3/8	25	25 1/4	20x 8
3	2 15/16	2 3/16	36	24 3/8	28 7/8	33 3/8	22 7/8	35 1/4	55 1/2	38	40 1/4	35 1/2	32 1/4	27	27 1/2	22x 8
3 1/2	3 3/16	2 7/16	42	28 1/4	33 3/4	39	26 1/4	41 1/8	64 3/4	44	45 1/2	40 1/2	37 1/8	30 1/2	32 1/8	24x 8
4	3 7/16	2 11/16	48	32 1/2	38 1/2	44 1/2	29 7/8	47	74	50	51 1/4	46 1/4	42	34	36 5/8	28x 8
4 1/2	3 15/16	2 15/16	54	36 3/4	43 1/8	49 7/8	33 1/4	52 7/8	83 1/4	56	56 1/2	51 1/2	47 1/8	37	41 1/4	30x 8
5	4 7/16	3 3/16	60	40 1/2	48	55 1/2	36 1/2	58 3/4	92 1/2	62	63 1/4	57 1/4	53 1/8	42 1/2	45 7/8	36x10
5 1/2	4 15/16	3 7/16	66	44 5/8	52 7/8	61 1/8	39 7/8	64 5/8	101 3/4	68	68 1/2	62 1/2	58	45 1/2	50 3/8	40x10
6	5 1/2	3 15/16	72	48 5/8	57 5/8	66 5/8	43 1/8	70 1/2	111	74	74 3/4	69	62 5/8	48 1/2	55	44x10
6 1/2	6	4 7/16	78	52 5/8	62 3/8	72 1/8	46 3/8	76 3/8	120 1/4	80	81 1/4	75 1/4	67 1/2	52	59 1/2	48x10
7	6 3/4	4 15/16	84	56 3/4	67 1/4	77 3/4	50 3/4	82 1/4	129 1/2	86	87 7/8	81 5/8	73 3/8	56	64 1/4	52x12
7 1/2	7 1/2	4 15/16	90	60 7/8	72 1/8	83 3/8	54 1/8	88 1/8	138 3/4	92	92 1/2	86 1/4	78 1/8	59	68 3/4	56x12
8	8	5 1/2	96	64 7/8	76 7/8	88 7/8	57 3/8	94	148	98	98 7/8	92 7/8	83	62	73 1/4	60x12

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

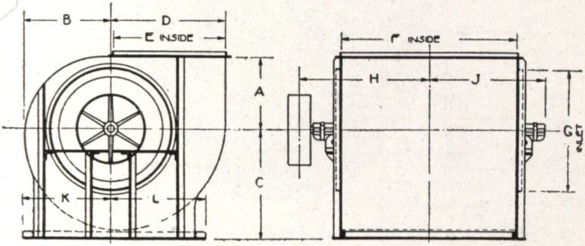
The B&B Line of Massachusetts Modified Squirrel Cage Fans

Principal Dimensions

in Inches

Full Housed Top Vertical Discharge

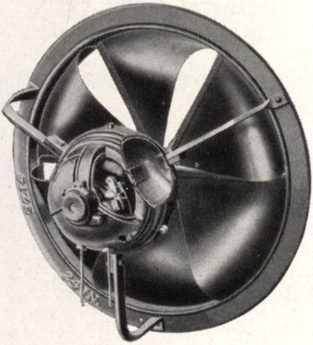
Double Width **Double Inlet**



SIZE	Shaft at Center	Size of Bearing	Wheel	A	B	C	D	E	F	G	H	J	K	L	Pulley
1½	1 11/16	1 7/16	18	11⅜	13⅝	18⅜	18⅛	17⅝	27¾	19	22	19¼	16¾	16¼	10x 6
1¾	1 15/16	1 7/16	21	13⅜	16	21⅛	21¼	20⅝	32¼	23	25	21½	18¼	18⅝	12x 6
2	2 3/16	1 11/16	24	15¼	18¼	23¾	24¼	23½	37	26	28	24½	20¼	23½	14x 6
2¼	2 7/16	1 15/16	27	17⅛	20½	26⅜	27¼	26½	41½	29	31½	28	21¾	24	16x 6
2½	2 7/16	1 15/16	30	19	22¾	29	30¼	29⅜	46¼	32	34	30¼	23¼	25	18x 6
2¾	2 11/16	2 3/16	33	21	25⅛	31¾	33⅜	32⅜	50¾	35	38	33	25¼	28	20x 8
3	2 15/16	2 3/16	36	22⅞	27⅜	34⅞	36⅜	35¼	55½	38	40¼	35½	27¼	30	22x 8
3½	3 3/16	2 7/16	42	26¾	32	40¼	42½	41⅛	64¾	44	45½	40½	30¾	34¾	24x 8
4	3 7/16	2 11/16	48	30½	36½	45½	48½	47	74	50	51¼	46¼	34¼	42¾	28x 8
4½	3 15/16	2 15/16	54	34¼	41	50¾	54½	52⅞	83¼	56	56½	51½	37¼	44	30x 8
5	4 7/16	3 3/16	60	38⅛	45⅝	56⅝	60⅝	58¾	92½	62	63¼	57¼	42¾	49	36x10
5½	4 15/16	3 7/16	66	42	50¼	62	66¾	64⅝	101¾	68	68½	62½	45¾	52¾	40x10
6	5½	3 15/16	72	45¾	54¾	67¼	72¾	70½	111	74	74¾	69	48¾	57	44x10
6½	6	4 7/16	78	49½	59¼	72½	78¾	76⅜	120¼	80	81¼	75¼	52¼	61¾	48x10
7	6¾	4 15/16	84	53⅜	63⅞	78⅞	84⅞	82¼	129½	86	87⅞	81⅝	56¼	67½	52x12
7½	7½	4 15/16	90	57¼	68½	84¼	91	88⅛	138¾	92	92½	86¼	59¼	71¾	56x12
8	8	5½	96	61	73	89½	97	94	148	98	98⅞	92⅞	62¼	75¾	60x12

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

MASSACHUSETTS PROPELLER FAN TYPE "R"



Illustrating Accessibility to Brushes and Inspection of Motor

This shows one of the inspection covers opened for commutator and brush inspection; they are closed thereafter for protection to motor, thus preventing moisture or sediment from entering the windings when fan is in operation.

All direct current motors are equipped with hinged inspection covers and protective type brush holders for commutator protection.

Bearings on all Direct Current Propeller Fans up to and including 48-inch size are wool-packed. Extra high-grade carded wool is securely packed around bearing sleeve. These bearings insure ample lubrication and maintain, at all times, a thin film of oil between shaft and bearing sleeve. Frequent oiling is unnecessary. Oil rings and their danger of sticking are eliminated.

D. C. Fans, 54-inch and larger, are of ball bearing design.

Brush-Holders on Direct Current Motor Fans 16 inches and above are of the improved box-type and possess many advantages, such as noiseless operation; maximum current capacity, insuring non-heating operation in either direction of rotation; pig-tail connections, eliminating all sliding contact difficulties; adjustable tension. Holder allows brush to wear at the same degree of angle throughout the life of brush.

Special acid-resistance metal is used in the construction of fan-wheels for all fans handling acids. We recommend their use and can furnish them at small additional cost above standard wheels.

Alternating Current Propeller Fans

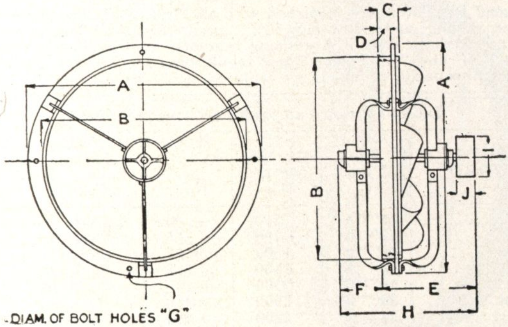
The very latest ideas on improved propeller fan construction are embodied in the wonderful mechanical perfection of these fans. The motors are of the protected type, provision being made for easy accessibility and inspection of working parts within motor by removal of hand-hole cover. The motor windings are protected against dirt, grease or other foreign substances from entering therein.

Bearings on all Fans up to and including 48-inch size are wool-packed. Extra high-grade carded wool is securely packed around bearing sleeve. These bearings insure ample lubrication and maintain, at all times, a thin film of oil between shaft and bearing sleeve. Frequent oiling is unnecessary. Oil rings and their danger of sticking are eliminated.

Shafts in all Motors are of extremely large size in diameter, accurately ground, embodying special treatment.

Rotors in all Multiphase Motors are of the indestructible type and design and are accurately machined and balanced.

PULLEY DRIVEN TYPE PROPELLER FANS



Dimensions—Inches

SIZE INCHES	A	B	C	D	E	F	G	H	I	J
18	21½	19	1⅜	1	12½	8	5/16	20½	4	2
20	24	21	2	1⅛	12½	8	⅜	20½	5	2
24	28½	25½	2	1⅛	14½	8¼	⅜	22¾	5	2
30	35	31	2⅜	1¼	14½	8¼	⅝	22¾	6	3
36	42½	38	2⅝	1⅜	14½	8¼	⅝	22¾	6	3
42	49	44½	3	1⅞	16	9	⅝	25	7	4
48	55½	50	3½	2	18	10	¾	28	8	5
54	61	56	4	2½	19	10	¾	29	10	5
60	68	63	4	2½	22	12	¾	34	10	5
72	81	74	5	3	22	14	1.	36	12	6

NOTE - CERTIFIED DIMENSION PRINTS ISSUED ON APPLICATION.—

PERFORMANCE DATA

CODE WORD	Size Fan	Normal R.P.M.	Air Per Min.	H.P. Req'd	Pulley		Approx Shp'g Weight
					Dia.	Face	
Vinlid	**18″**	1050	2100	⅙	4″	2″	**70**
Vinloo	**20″**	950	2900	¼	5″	2″	**88**
Vinley	**24″**	850	4400	½	5″	2″	**125**
Vinment	**30″**	690	7500	¾	6″	2½″	**190**
Vinmod	**36″**	600	10000	1.0	6″	3″	**275**
Vinnoss	**42″**	500	13500	1.5	7″	4″	**390**
Vinody	**48″**	450	18000	2.0	8″	5″	**550**
Vinoe	**54″**	425	24000	3.0	10″	5″	**700**
Vinoff	**60″**	375	27500	3.5	10″	5″	**850**
Vintage	**72″**	300	38000	4.5	12″	6″	**1050**

Air deliveries based on restrictive tests.

PULLEYS on all horizontal fans are of steel split crown face design. Vertical fans are equipped with either groove or double flange pulleys; special sizes cost extra.

EXHAUST FANS—PROPELLER TYPE—DIRECTLY CONNECTED TYPE R

Speed Regulators are furnished with all D. C. Fans 20-in. "B" and larger, giving approximately 50% speed reduction below normal by intermediate steps. A starting regulator only is furnished with 18-in. "A" and "B" Fans. These regulators serve to vary the speed when full capacity of fans is not required.

Direct Current Fans and Performance Tables

CODE WORD	Size Type	Cu. Ft. Air per Min.	Watts Cons. per Hour	Revolutions per Min.	Approx. Ship'g Wt.
Wall	12″"A"	500	60	1200	60
Wold	12″"B"	700	65	1700	60
Whirl	16″"B"	1500	95	1250	65
Was	18″"A"	2100	115	1050	80
Wise	18″"B"	2500	165	1160	80
Waist	20″"B"	2900	210	950	140
Wet	24″"A"	4200	284	830	200
Wander	24″"B"	4600	425	900	225
Win	30″"A"	7500	458	690	250
Wizard	30″"B"	9000	500	825	350
Wipe	36″"A"	10000	575	600	420
Warp	36″"B"	12000	780	725	525
Will	42″"B"	13500	875	500	600
Went	48″"B"	18500	1330	460	700
Ward	54″"B"	23000	1720	410	1025
Weed	60″"B"	27500	2325	375	1400
Wade	72″"B"	36000	2900	275	2300
Alternating Current Fans—Constant Speed—Single Phase—60 Cycles					
Quer	12″"A"	500	55	1160	60
Quell	12″"B"	700	65	1700	60
Quop	16″"A"	1200	80	860	60
Quipe	16″"B"	1500	90	1160	60
Quire	18″"A"	1800	105	860	80
Quad	18″"B"	2500	165	1160	80
Quan	20″"A"	2600	180	860	100
Quaint	20″"B"	3300	195	1160	100
Quail	24″"A"	3500	235	690	180
Quit	24″"B"	4400	285	860	180
Quart	30″"B"	6500	465	690	260

Type "B" Fans only are manufactured for vertical operation.

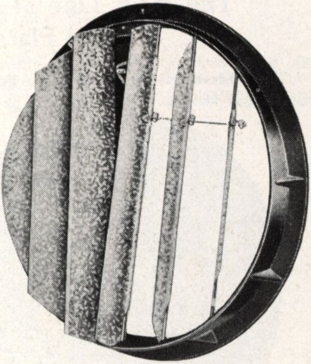
MULTIPHASE—60 CYCLES

Pin	18″"B"	2500	175	1160	80
Pipe	20″"A"	2600	180	860	110
Post	20″"B"	3300	195	1160	110
Put	24″"A"	3500	235	690	160
Pay	24″"B"	4400	285	860	160
Pass	30″"A"	6200	325	570	230
Pent	30″"B"	7500	465	690	230
Purr	36″"A"	8400	530	495	450
Pill	36″"B"	9800	615	575	450
Pine	42″"B"	13300	830	495	600
Prank	48″"B"	19400	1415	495	650
Pond	54″"B"	24000	1740	425	1000
Pard	60″"B"	28000	2140	380	1300
Pearl	72″"B"	38200	2840	285	1500

Type "A" Fans not furnished for vertical operation.
Alternating current motors above are wound for constant speed.

(*When ordering specify cycle, phase and voltage.*)

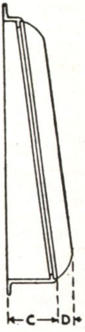
Louvres

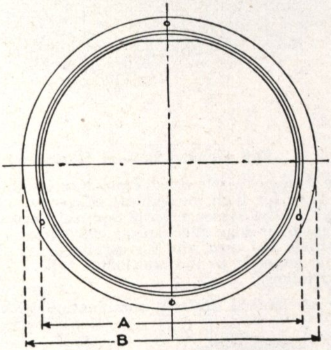


(*Patented*)

All working parts of Louvres are constructed of brass, the pivot rods also being of brass, which eliminates rust or corrosion within working bearings. A double brass arm is provided of which each vane or blade is connected in series thereto and upon oscillation of one of the vanes a corresponding oscillating movement is imparted to each of the other vanes.

Louvres are especially designed to prevent back draft and provide weather protection to fan openings when the fan is not running. They consist of a number of semi-circular vanes connected together in series; these vanes are pivoted slantingly with respect to a vertical plane and are incined to drop into a closing position without exerting an excessive resistance against their opening movement caused by air directed against them from the opposite side.

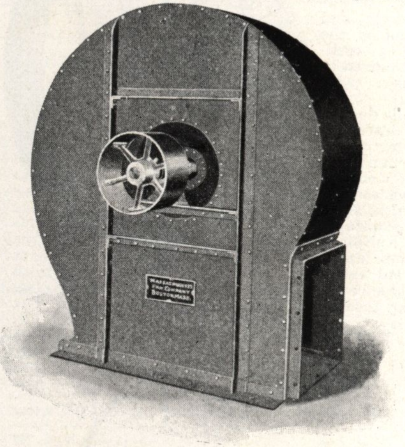




Code Word	No.	A	B	C	D	Shipping Wt.
Reabe	12	12¼	14¼	2½	2	20
Reafy	16	16½	18⅞	3½	3¾	27
Reahs	18	19	21⅞	3¾	4¼	38
Realt	20	21½	24⅜	4	4¾	48
Reamk	24	25½	29	4½	5½	65
Reang	30	31½	35	5	6¼	80
Reasz	36	39	42½	5½	6½	95
Ready	42	44	49½	6	7	110
Reap	48	50	56	6½	8	130
Reach	54	57	61½	7½	9	160
Reek	60	64	68½	8½	10	205
Renck	72	76	81	10	12	300

The B&B Line of Massachusetts Steel Plate Fans

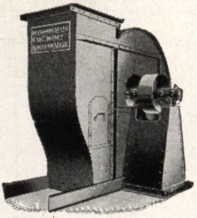
The Massachusetts Steel Plate Fan is the old standard type of centrifugal fan, sometimes known as the paddle wheel type. This type of fan is commonly used in connection with extended systems of ducts, and thus is of great service in heating and ventilation of public buildings, office buildings, factories, etc. In such service the resistance to be overcome is high. In mechanical draft work where air velocities are high, this type of fan is of exceptional service, and well adapted to it.

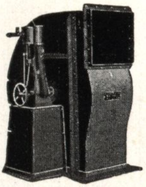


Full Housed Bottom Horizontal Discharge

The Massachusetts Steel Plate Fan is designed for large capacity rather than for high mechanical efficiency. The multiblade type of fan, such as the Massachusetts Squirrel Cage type, on the other hand is designed for high mechanical efficiencies. Both types have their applications and uses, and for certain types of service the steel plate fan is far superior to the multiblade type. These services are in the main as follows:

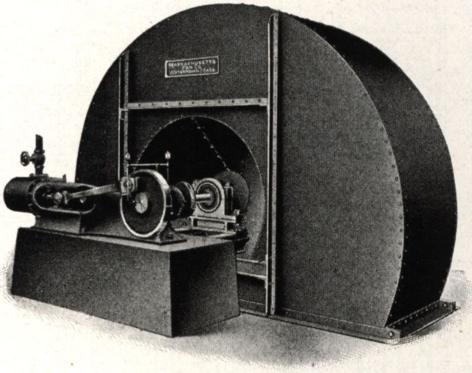
For mechanical draft in combination with a very thick fuel bed more than ordinary resistance is encountered, and if a multiblade fan were used as a blower the pressure developed would drop off and the capacity in proportion. A steel plate fan on the other hand under such conditions would permit the pressure to increase and adapt itself to variable conditions and resistance.





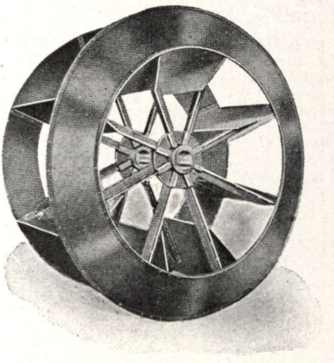
The B&B Line of Massachusetts Steel Plate Fans

Because of the inherent property of steel plate fans in adapting itself to working pressures, it is of great service in process work where it may be desirable to operate the fan during certain periods at an underload and still maintain a definite pressure.



Steel Plate Fan. Engine Driven

The spiders of these fan wheels are steel tees cast into iron hubs. The wheel is stiffened with heavy steel bar rings and balanced, insuring freedom from vibration or straining under working pressure. For extra heavy duty, special wheels are furnished with heavy I-beam arms and extra strong bracing. The housing is built of heavy steel plate bolted and riveted to large steel angles, making a completely rigid structure. Larger sizes than those listed are built to meet particular requirements. Fans are furnished either right or left hand with top, bottom, vertical or angular discharges in full and three-quarter housings, direct or belt drive, from motor or engine.

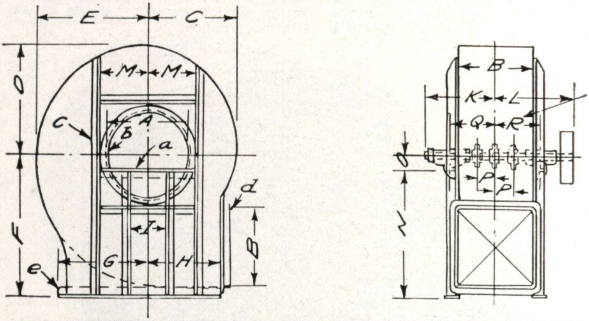


Standard design is with straight floats, but for certain classes of ventilation work the blades may be slightly curved backwards at the tips. Doing so reduces eddy air currents at the back of the float, reduces vibration and eliminates noise.

The B&B Line of Massachusetts Steel Plate Fans

Dimensions

Full housed—Bottom horizontal discharge



Size Fan	A	B	C	D	E	F	G	H	I	Pulley Size	Shaft Dia.
40	16½	15	16	18	20	24½	16	15	9	12x 4	1 7/16
50	21	18	19¾	22¼	24¾	29¾	20	18	9	13x 4	1 11/16
60	25	21½	23½	26½	29½	35	24	21	10	14x 4	1 15/16
70	27	25	27¼	30¾	34¼	40¾	28	24½	10	16x 4	2 3/16
80	30½	27	31	35	39	46	32	26½	10	18x 4	2 7/16
90	34½	31	34¾	39¼	43¾	51¼	35	30¼	10	20x 5	2 7/16
100	38	34	38½	43½	48½	57	38	32¾	13	22x 6	2 11/16
110	42	37½	42¼	47¾	53¼	62¼	42	35¾	13	24x 6	2 11/16
120	46	41	46	52	58	67½	46	39½	13	26x 6	2 15/16
130	49½	44	49¾	56¼	62¾	72¾	50	42¼	13	28x 6	2 15/16
140	53½	48	53½	60½	67½	78	53	45½	14	30x 7	3 3/16
160	60	54	61	69	77	88½	60	51½	14	32x 8	3 7/16
180	68	60	68½	77½	86½	100	67	57½	14	36x 8	3 7/16
200	76	66	76	86	96	110½	74	63½	15	40x10	3 15/16
220	84	72	83½	94½	105½	121	82	69½		44x12	4 7/16
240	92	78	91	103	115	131½	90	76¼		46x14	4 15/16

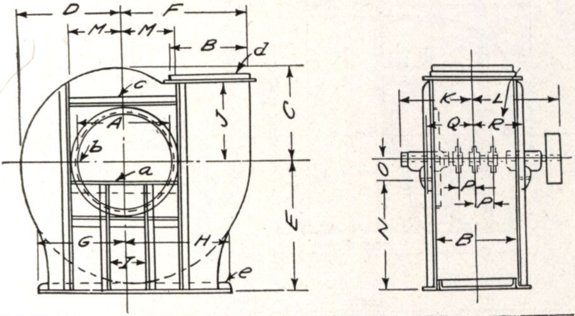
Size Fan	K	L	M	N	O	P	Q	R	Pulley Size	Shaft Dia.
40	14⅝	17⅞	9¾	20⅛	4⅜	Only 1 Spider	9 5/16	9⅛	12x 4	1 7/16
50	16¾	20	12	25⅛	4⅝		10 13/16	10⅝	13x 4	1 11/16
60	19¾	22⅞	14	29⅜	5⅝		13 1/16	12⅞	14x 4	1 15/16
70	22	25⅛	15	35	5¾		14 13/16	14⅝	16x 4	2 3/16
80	23½	26⅝	16¾	39 15/16	6 1/16		15 13/16	15⅝	18x 4	2 7/16
90	25½	29⅝	18¾	45 3/16	6 1/16		17 13/16	17⅝	20x 5	2 7/16
100	28⅛	33¼	20½	50 1/16	6 15/16		19 13/16	19⅝	22x 6	2 11/16
110	29⅞	35	22½	55 5/16	6 15/16	9	21 9/16	21⅜	24x 6	2 11/16
120	32¼	37⅜	24¾	60 7/16	7 1/16	9¾	23 5/16	23⅛	26x 6	2 15/16
130	33¾	38⅞	26½	65 11/16	7 1/16	10½	24 15/16	24⅝	28x 6	2 15/16
140	36⅞	42⅞	28½	70¼	7¾	11½	27 5/16	27⅛	30x 7	3 3/16
160	40⅝	47⅝	31¾	80⅝	7⅞	13	30 5/16	30⅛	32x 8	3 7/16
180	43⅝	50⅝	36¼	92⅛	7⅞	14	33 5/16	33⅛	36x 8	3 7/16
200	48⅜	57⅜	40¼	101¼	9¼	16	36 15/16	36⅝	40x10	3 15/16
220	53½	64⅛	44¼	111	10	17½	40 5/16	40⅛	44x12	4 7/16
240			48¼			19			46x14	4 15/16

Use Dimension R in above table on pulley side of single inlet fans only. Foundations to be of size and depth required by the soil.

The B&B Line of Massachusetts Steel Plate Fans

Dimensions

Full housed—Top vertical discharge



Size Fan	A	B	C	D	E	F	G	H	I	Pulley Size	Shaft Dia.
40	16½	15	16	18	22½	22	15½	18	9	12x 4	1 7/16
50	21	18	19¾	22¼	27¼	27¼	19	22	9	13x 4	1 11/16
60	25	21½	23½	26½	32	32½	22½	26	10	14x 4	1 15/16
70	27	25	27¼	30¾	37¼	37¾	26½	30½	10	16x 4	2 3/16
80	30½	27	31	35	42	43	30	34½	10	18x 4	2 7/16
90	34½	31	34¾	39¼	46¾	48¼	33½	39	10	20x 5	2 7/16
100	38	34	38½	43½	52	53½	37	43	13	22x 6	2 11/16
110	42	37½	42¼	47¾	56¾	58¾	41	47	13	24x 6	2 11/16
120	46	41	46	52	61½	64	44½	51½	13	26x 6	2 15/16
130	49½	44	49¾	56¼	66¼	69¼	48	55½	13	28x 6	2 15/16
140	53½	48	53½	60½	71	74½	51½	60	14	30x 7	3 3/16
160	60	54	61	69	80½	85	59	68	14	32x 8	3 7/16
180	68	60	68½	77½	91	95½	66	76½	14	36x 8	3 7/16
200	76	66	76	86	100½	106	73½	86	15	40x10	3 15/16
220	84	72	83½	94½	110	116½	80½	93		44x12	4 7/16
240	92	78	91	103	119½	127	87½	103		46x14	4 15/16

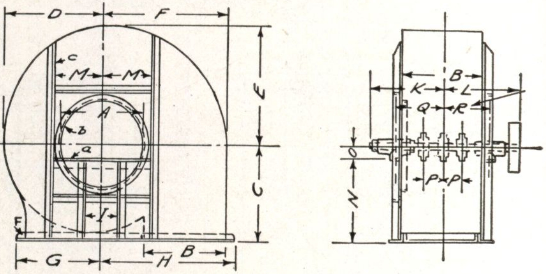
Size Fan	J	K	L	M	N	O	P	Q	R	Pulley Size	Shaft Dia.
40	15	14⅝	17⅞	9¾	18⅛	4⅜	Only 1 Spider	9 5/16	9⅛	12x 4	1 7/16
50	18	16¾	20	12	22⅝	4⅝		10 13/16	10⅝	13x 4	1 11/16
60	21	19¾	22⅞	14	26⅜	5⅝		13 1/16	12⅞	14x 4	1 15/16
70	24½	22	25⅛	15	31½	5¾		14 13/16	14⅝	16x 4	2 3/16
80	26½	23½	26⅝	16¾	35 15/16	6 1/16		15 13/16	15⅝	18x 4	2 7/16
90	30¼	25½	29⅝	18¾	40 11/16	6 1/16		17 13/16	17⅝	20x 5	2 7/16
100	32¾	28⅛	33¼	20½	45 1/16	6 15/16		19 13/16	19⅝	22x 6	2 11/16
110	35¾	29⅞	35	22½	49 13/16	6 15/16	9	21 9/16	21⅜	24x 6	2 11/16
120	39½	32¼	37⅜	24¾	54 7/16	7 1/16	9¾	23 5/16	23⅛	26x 6	2 15/16
130	42¼	33¾	38⅞	26½	59 3/16	7 1/16	10½	24 13/16	24⅝	28x 6	2 15/16
140	45½	36⅞	42⅞	28½	63¼	7¾	11½	27 5/16	27⅛	30x 7	3 3/16
160	51½	40⅝	47⅝	31¾	72⅝	7⅞	13	30 5/16	30⅛	32x 8	3 7/16
180	57½	43⅝	50⅝	36¼	83⅛	7⅞	14	33 5/16	33⅛	36x 8	3 7/16
200	63½	48⅜	57⅜	40¼	91¼	9¼	16	36 13/16	36⅝	40x10	3 15/16
220	69½	53½	64⅛	44¼	100	10	17½	40 5/16	40⅛	44x12	4 7/16
240	76¼			48¼			19			46x14	4 15/16

Use Dimension R in above table on pulley side of single inlet fans only. Foundations to be of size and depth required by the soil.

The B&B Line of Massachusetts Steel Plate Fans

Dimensions

Full housed—Bottom vertical discharge



Size Fan	A	B	C	D	E	F	G	H	I	Pulley Size	Shaft Dia.
40	16½	15	18½	18	20	22	15½	25	9	12x 4	1 7/16
50	21	18	22¼	22¼	24¾	27¼	19	30¼	9	13x 4	1 11/16
60	25	21½	26	26½	29½	32½	22½	35½	10	14x 4	1 15/16
70	27	25	30¼	30¾	34¼	37¾	26½	41¼	10	16x 4	2 3/16
80	30½	27	34	35	39	43	30	46½	10	18x 4	2 7/16
90	34½	31	37¾	39¼	43¾	48¼	33½	51¾	10	20x 5	2 7/16
100	38	34	42	43½	48½	53½	37	57½	13	22x 6	2 11/16
110	42	37½	45¾	47¾	53¼	58¾	41	62¾	13	24x 6	2 11/16
120	46	41	49½	52	58	64	44½	69	13	26x 6	2 15/16
130	49½	44	53¼	56¼	62¾	69¼	48	74¼	13	28x 6	2 15/16
140	53½	48	57	60½	67½	74½	51½	79½	14	30x 7	3 3/16
160	60	54	64½	69	77	85	59	90	14	32x 8	3 7/16
180	68	60	73	77½	86½	95½	66	101½	14	36x 8	3 7/16
200	76	66	80½	86	96	106	73½	112	15	40x10	3 15/16
220	84	72	88	94½	105½	116½	80½	122½		44x12	4 7/16
240	92	78	95½	103	115	127	87½	133		46x14	4 15/16

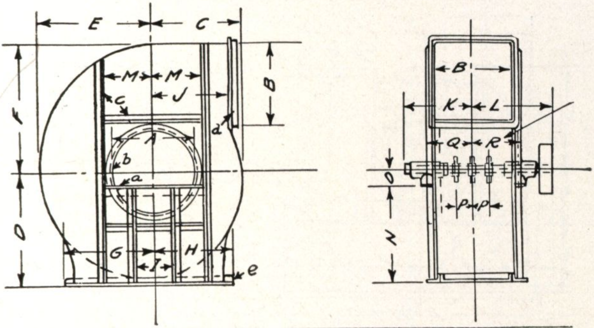
Size Fan	K	L	M	N	O	P	Q	R	Pulley Size	Shaft Dia.
40	14⅝	17⅞	9¾	14⅛	4⅜	Only 1 Spider	9 5/16	9⅛	12x 4	1 7/16
50	16¾	20	12	17⅝	4⅝		10 13/16	10⅝	13x 4	1 11/16
60	19¾	22⅞	14	20⅜	5⅝		13 1/16	12⅞	14x 4	1 15/16
70	22	25⅛	15	24½	5¾		14 13/16	14⅝	16x 4	2 3/16
80	23½	26⅝	16¾	27 15/16	6 1/16		15 13/16	15⅝	18x 4	2 7/16
90	25½	29⅝	18¾	31 11/16	6 1/16		17 13/16	17⅝	20x 5	2 7/16
100	28⅛	33¼	20½	35 1/16	6 15/16		19 13/16	19⅝	22x 6	2 11/16
110	29⅞	35	22½	38 13/16	6 15/16	9	21 9/16	21⅜	24x 6	2 11/16
120	32¼	37⅜	24¾	42 7/16	7 1/16	9¾	23 5/16	23⅛	26x 6	2 15/16
130	33¾	38⅞	26½	46 3/16	7 1/16	10½	24 13/16	24⅝	28x 6	2 15/16
140	36⅞	42⅞	28½	49¼	7¾	11½	27 5/16	27⅛	30x 7	3 3/16
160	40⅝	47⅝	31¾	56⅝	7⅞	13	30 5/16	30⅛	32x 8	3 7/16
180	43⅝	50⅝	36¼	65⅛	7⅞	14	33 5/16	33⅛	36x 8	3 7/16
200	48⅜	57⅜	40¼	71¼	9¼	16	36 13/16	36⅝	40x10	3 15/16
220	53½	64⅛	44¼	78	10	17½	40 5/16	40⅛	44x12	4 7/16
240			48¼			19			46x14	4 15/16

Use Dimension R in above table on pulley side for single inlet fans only. Foundations to be of size and depth as required by the soil.

The B&B Line of Massachusetts Steel Plate Fans

Dimensions

Full housed—Top horizontal discharge



Size Fan.	A	B	C	D	E	F	G	H	I	Pulley Size	Shaft Dia.
40	16½	15	16	20½	20	22	16	14	9	12x 4	1 7/16
50	21	18	19¾	24¾	24¾	27¼	20	17	9	13x 4	1 11/16
60	25	21½	23½	29	29½	32½	24	21	10	14x 4	1 15/16
70	27	25	27¼	33¾	34¼	37¾	28	24	10	16x 4	2 3/16
80	30½	27	31	38	39	43	32	27	10	18x 4	2 7/16
90	34½	31	34¾	42¼	43¾	48¼	35	30	10	20x 5	2 7/16
100	38	34	38½	47	48½	53½	38	33	13	22x 6	2 11/16
110	42	37½	42¼	51¼	53¼	58¾	42	36	13	24x 6	2 11/16
120	46	41	46	55½	58	64	46	40	13	26x 6	2 15/16
130	49½	44	49¾	59¾	62¾	69¼	50	43	13	28x 6	2 15/16
140	53½	48	53½	64	67½	74½	53	45	14	30x 7	3 3/16
160	60	54	61	72½	77	85	60	50	14	32x 8	3 7/16
180	68	60	68½	82	86½	95½	67	56	14	36x 8	3 7/16
200	76	66	76	90½	96	106	74	64	15	40x10	3 15/16
220	84	72	83½	99	105½	116½	82	72		44x12	4 7/16
240	92	78	91	107½	115	127	90	82		46x14	4 15/16

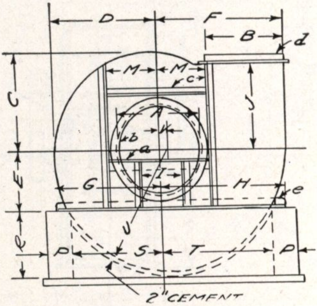
Size Fan	J	K	L	M	N	O	P	Q	R	Pulley Size	Shaft Dia.
40	15	14⅝	17⅞	9¾	16⅛	4⅜	Only 1 Spider	9 5/16	9⅛	12x 4	1 7/16
50	18	16¾	20	12	20⅛	4⅝		10 13/16	10⅝	13x 4	1 11/16
60	21	19¾	22⅞	14	23⅜	5⅝		13 1/16	12⅞	14x 4	1 15/16
70	24½	22	25⅛	15	28	5¾		14 13/16	14⅝	16x 4	2 3/16
80	26½	23½	26⅝	16¾	31 15/16	6 1/16		15 13/16	15⅝	18x 4	2 7/16
90	30¼	25½	29⅝	18¾	36 3/16	6 1/16		17 13/16	17⅝	20x 5	2 7/16
100	32¾	28⅛	33¼	20½	40 1/16	6 15/16		19 13/16	19⅝	22x 6	2 11/16
110	35¾	29⅞	35	22½	44 5/16	6 15/16	9	21 9/16	21⅜	24x 6	2 11/16
120	39½	32¼	37⅜	24¾	48 7/16	7 1/16	9¾	23 5/16	23⅛	26x 6	2 15/16
130	42¼	33¾	38⅞	26½	52 11/16	7 1/16	10½	24 13/16	24⅝	28x 6	2 15/16
140	45½	36⅞	42⅞	28½	56¼	7¾	11½	27 5/16	27⅛	30x 7	3 3/16
160	51½	40⅝	47⅝	31¾	64⅝	7⅞	13	30 5/16	30⅛	32x 8	3 7/16
180	57½	43⅝	50⅝	36¼	74⅛	7⅞	14	33 5/16	33⅛	36x 8	3 7/16
200	63½	48⅜	57⅜	40¼	81¼	9¼	16	36 13/16	36⅝	40x10	3 15/16
220	69½	53½	64⅛	44¼	89	10	17½	40 5/16	40⅛	44x12	4 7/16
240	76¼			48¼			19			46x14	4 15/16

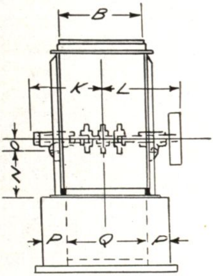
Use Dimension R in above table on pulley side for single inlet fans only Foundations to be of size and depth as required by the soil.

The B&B Line of Massachusetts Steel Plate Fans

Dimensions

¾ housing—Top vertical discharge





Size Fan	A	B	C	D	E	F	G	H	I	J	K	Pulley Size	Shaft Dia.
60	25	21½	23½	26½	16	32½	26½	31⅜	10	21	19¾	14x 4	1 15/16
70	27	25	27¼	30¾	17½	37¾	30⅜	37⅛	10	24½	22	16x 4	2 3/16
80	30½	27	31	35	19¼	43	35½	42	10	26½	23½	18x 4	2 7/16
90	34½	31	34¾	39¼	21¼	48¼	39⅜	46⅝	10	30½	25½	20x 5	2 7/16
100	38	34	38½	43½	23½	53½	43⅞	52	13	33⅜	28⅛	22x 6	2 11/16
110	42	37½	42¼	47¾	25½	58¾	47¾	56¾	13	36⅞	29⅞	24x 6	2 11/16
120	46	41	46	52	27¾	64	52½	62⅜	13	40¼	32¼	26x 6	2 13/16
130	49½	44	49¾	56¼	29½	69¼	56½	67¼	13	43¼	33¾	28x 6	2 15/16
140	53½	48	53½	60½	31½	74½	60⅜	71⅞	14	47¼	36⅞	30x 7	3 3/16
160	60	54	61	69	34¾	85	68½	81¾	14	53¼	40⅝	32x 8	3 9/16
180	68	60	68½	77½	40¼	95½	77⅛	91⅞	14	59¼	43⅝	36x 8	3 7/16
200	76	66	76	86	44¼	106	84⅞	101¼	15	65¼	48⅜	40x10	3 15/16
220	84	72	83½	94½	48¼	116½	92¾	110¾		71¼	53½	44x12	4 7/16
240	92	78	91	103	52¼	127	100½	120⅛		77¼		46x14	4 15/16

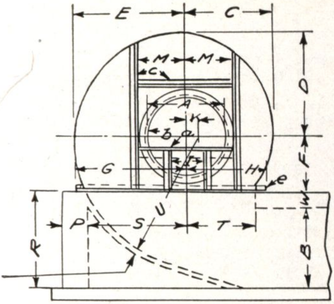
Size Fan	L	M	N	O	P	Q	R	S	T	U	V	Pulley Size	Shaft Dia.
60	22⅞	14	10⅜	5⅝	8	21	15½	22½	27¼	29½	2⅜	14x 4	1 15/16
70	25⅛	15	11¾	5¾	8	24½	18¾	26¾	32¼	34¼	2¾	16x 4	2 3/16
80	26⅝	16¾	13 3/16	6 1/16	8	26½	21¾	30¾	37	39	3⅛	18x 4	2 7/16
90	29⅝	18¾	15 3/16	6 1/16	8	30½	24½	34¾	41¾	43¾	3½	20x 5	2 7/16
100	33¼	20½	16 9/16	6 15/16	8	33⅜	27	38⅜	46⅜	48½	4	22x 6	2 11/16
110	35	22½	18 9/16	6 15/16	8	36⅞	29¾	42⅜	51⅛	53¼	4⅜	24x 6	2 11/16
120	37⅜	24¾	20 11/16	7 1/16	12	40¼	32¼	46¼	55¾	58	4¾	26x 6	2 13/16
130	38⅞	26	22 7/16	7 1/16	12	43¼	35¼	50⅛	60½	62¾	5 3/16	28x 6	2 15/16
140	42⅞	28½	23¾	7¾	12	47¼	38	54	65¼	67½	5½	30x 7	3 3/16
160	47⅝	31¾	26⅞	7⅞	12	53¼	44¼	62¼	75¼	77	6½	32x 8	3 7/16
180	50⅝	36¼	32⅜	7⅞	12	59¼	48¼	69¼	83¾	86½	7¼	36x 8	3 7/16
200	57⅜	40¼	35	9¼	12	65¼	53¾	77¼	93¼	96	8	40x10	3 15/16
220	64⅛	44¼	38¼	10	16	71¼	59¼	84⅞	102¾	105½	8 15/16	44x12	4 7/16
240		48¼			16	77¼	64¾	92¾	112¼	115	9¾	46x14	4 15/16

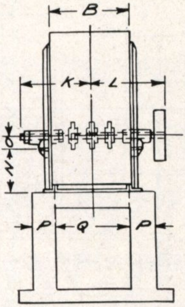
Foundtions to be of a size and depth as required by the soil.

The B&B Line of Massachusetts Steel Plate Fans

Dimensions

¾ housed—Bottom horizontal discharge





Size Fan	A	B	C	D	E	F	G	H	I	K	L	Pulley Size	Shaft Dia.
60	25	21½	23½	26½	29½	16	29⅞	20⅛	10	19¾	22⅞	14x 4	1 15/16
70	27	25	27¼	30¾	34¼	17½	34⅞	24	10	22	25⅛	16x 4	2 3/16
80	30½	27	31	35	39	19¼	39¾	27⅝	10	23½	26⅝	18x 4	2 7/16
90	34½	31	34¾	39¼	43¾	21¼	44¼	30½	10	25½	29⅝	20x 5	2 7/16
100	38	34	38½	43½	48½	23½	49¼	34¼	13	28⅛	33¼	22x 6	2 11/16
110	42	37½	42¼	47¾	53¼	25½	53⅝	37⅛	13	29⅞	35	24x 6	2 11/16
120	46	41	46	52	58	27¾	59	40⅞	13	32¼	37⅜	26x 6	2 15/16
130	49½	44	49¾	56¼	62¾	29½	63½	44	13	33¾	38⅞	28x 6	2 15/16
140	53½	48	53½	60½	67½	31½	68	47¼	14	36⅞	42⅞	30x 7	3 3/16
160	60	54	61	69	77	34¾	77¼	53⅜	14	40⅝	47⅝	32x 8	3 7/16
180	68	60	68½	77½	86½	40¼	86¾	59⅞	14	43⅝	50⅝	36x 8	3 7/16
200	76	66	76	86	96	44¼	95⅝	65¾	15	48⅜	57⅜	40x10	3 15/16
220	84	72	83½	94½	105½	48¼	104½	71⅝		53½	64⅛	44x12	4 7/16
240	92	78	91	103	115	52¼	113½	77¼				46x14	4 15/16

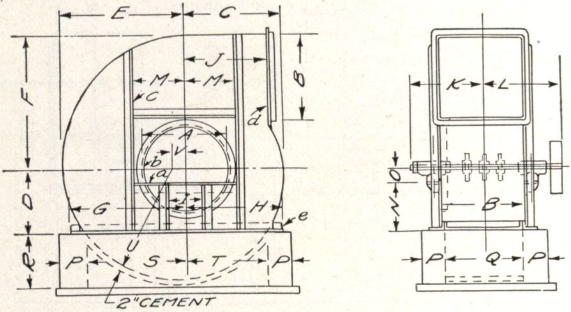
Size Fan	M	N	O	P	Q	R	S	T	U	V	W	Pulley Size	Shaft Dia.
60	14	10⅜	5⅝	8	21	27½	25¼	17⅛	32½	3	6	14x 4	1 15/16
70	15	11¾	5¾	8	24½	31	30	20½	37¾	3½	6	16x 4	2 3/16
80	16¾	13 3/16	6 1/16	8	26½	33	35¼	24⅛	43	4	6	18x 4	2 7/16
90	18¾	15 3/16	6 1/16	8	30½	37	38	27	48¼	4½	6	20x 5	2 7/16
100	20½	16 9/16	6 15/16	8	33⅜	40	44	30¼	53½	5	6	22x 6	2 11/16
110	22½	18 9/16	6 15/16	8	36⅞	45½	48½	33⅛	58¾	5½	8	24x 6	2 11/16
120	24¾	20 11/16	7 1/16	12	40¼	49	52	35⅞	64	6	8	26x 6	2 15/16
130	26½	22 7/16	7 1/16	12	43¼	52	56	39	69¼	6½	8	28x 6	2 15/16
140	28½	23¾	7¾	12	47¼	56	61	42¼	74¼	7	8	30x 7	3 3/16
160	31¾	26⅞	7⅞	12	53¼	62	70	48⅜	85	8	8	32x 8	3 7/16
180	36¼	32⅜	7⅞	12	59¼	68	79	53⅞	95½	9	8	36x 8	3 7/16
200	40¼	35	9¼	12	65¼	76	87	59¾	106	10	10	40x10	3 15/16
220	44¼	38¼	10	16	71¼	82	96	65⅝	116½	11	10	44x12	4 7/16
240	48¼			16	77¼	88	105	71¼	127	12	10	46x14	4 15/16

Use a 2-inch thickness of cement on the dotted lines shown in the cut. Foundations to be of size and depth as required by the soil.

The B&B Line of Massachusetts Steel Plate Fans

Dimensions

¾ housed--Top horizontal discharge



Size Fan	A	B	C	D	E	F	G	H	I	J	K	Pulley Size	Shaft Dia.
40													
50													
60	25	21½	23½	16	29½	32½	27⅞	23⅛	10	21	19¾	14x 4	1 15/16
70	27	25	27¼	17½	34¼	37¾	33⅛	27½	10	24½	22	16x 4	2 3/16
80	30½	27	31	19¼	39	43	37⅜	31	10	26½	23½	18x 4	2 7/16
90	34½	31	34¾	21¼	43¾	48¼	41½	34⅜	10	30¼	25½	20x 5	2 7/16
100	38.	34	38½	23½	48½	53½	46⅜	38⅜	13	32¾	28⅛	22x 6	2 11/16
110	42	37½	42¼	25½	53¼	58¾	50½	41¾	13	35⅜	29⅞	24x 6	2 11/16
120	46	41	46	27¾	58	64	55½	46	13	39½	32¼	26x 6	2 15/16
130	49½	44	49¾	29½	62¾	69¼	59¾	49⅜	13	42¼	33¾	28x 6	2 15/16
140	53½	48	53½	31½	67½	74½	64	52¾	14	45½	36⅞	30x 7	3 3/16
160	60	54	61	34¾	77	85	72⅝	59¾	14	51½	40⅝	32x 8	3 7/16
180	68	60	68½	40¼	86½	95½	81⅝	67¼	14	57½	43⅝	36x 8	3 7/16
200	76	66	76	44¼	96	106	90	74	15	63½	48⅜	40x10	3 15/16
220	84	72	83½	48¼	105½	116½	98¼	80⅝		69½	53½	44x12	4 9/16
240	92	78	91	52¼	115	127	106⅝	87⅜		76¼		46x14	4 15/16

Size Fan	L	M	N	O	P	Q	R	S	T	U	V	Pulley Size	Shaft Dia.
40													
50													
60	22⅞	14	10⅜	5⅝	8	21	12½	23⅜	18⅞	26½	2¼	14x 4	1 15/16
70	25⅛	15	11¾	5¾	8	24½	15¼	27⅞	22⅝	30¾	2⅝	16x 4	2 3/16
80	26⅝	16¾	13 3/16	6 1/16	8	26½	17¾	32¼	26⅛	35	3 1/16	18x 4	2 7/16
90	29⅝	18¾	15 3/16	6 1/16	8	30½	20	36½	29½	39¼	3½	20x 5	2 7/16
100	33¼	20½	16 9/16	6 15/16	8	33⅜	22	40½	32¾	43½	3⅞	22x 6	2 11/16
110	35	22½	18 9/16	6 15/16	8	36⅞	24¼	44⅝	36	47¾	4 5/16	24x 6	2 11/16
120	37⅜	24¾	20 11/16	7 1/16	12	40¼	26¼	48½	39¼	52	4⅝	26x 6	2 15/16
130	38⅞	26½	22 7/16	7 1/16	12	43¼	28¾	53	42¾	56¼	5⅛	28x 6	2 15/16
140	42⅞	28½	23¾	7¾	12	47¼	31	57	46¼	60½	5⅜	30x 7	3 3/16
160	47⅝	31¾	26⅞	7⅞	12	53¼	36¼	65⅞	53⅛	69	6⅜	32x 8	3 7/16
180	50⅝	36¼	32⅜	7⅞	12	59¼	39¼	73¼	59⅛	77½	7 1/16	36x 8	3 7/16
200	57⅜	40¼	35	9¼	12	65¼	43¾	81½	66	86	7¾	40x10	3 15/16
220	64⅛	44¼	38¼	10	16	71¼	48¼	90	72½	94½	8¾	44x12	4 9/16
240		48¼			16	77¼	52¾	98	79¼	103	9⅜	46x14	4 15/16

Foundations to be of a size and depth as required by the soil

The B&B Line of Massachusetts Steel Plate Fans

CAPACITY TABLE FOR STEEL PLATE FANS

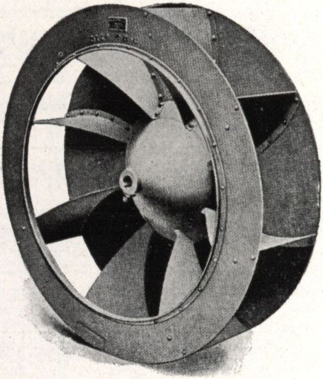
Size	Dia. Wheel	Inlet Diam.	Outlet Size	Pulley			PRESSURE IN OUNCES PER SQUARE INCH								
				Face	Dia.		¼	½	¾	1	1¼	1½	2	2½	3
40	24	16½	15 x15	12	4	C.F M.	1,825	2,585	3,160	3,650	4,080	4,480	5,170	5,760	6,330
						R.P.M.	482	682	835	965	1,078	1,181	1,365	1,522	1,670
						B.H.P	.311	.884	1.62	2.50	3.48	4.60	7.08	9.82	13.00
50	30	21	18 x18	13	4	C.F.M.	2,790	3,950	4,840	5,580	6,240	6,850	7,900	8,850	9,700
						R.P.M.	386	545	667	770	862	945	1,090	1,220	1,335
						B.H.P.	.48	1.35	2.48	3.81	5.32	7.05	10.80	15.50	19.80
60	36	25	21½x21½	14	4	C.F.M	4,080	5,770	7,200	8,170	9,150	10,000	11,520	12,990	14,100
						R.P.M.	321	454	556	642	718	786	907	1,015	1,110
						B.H.P.	70	1.97	3.68	5.57	7.81	10.22	15.70	22.00	28.62
70	42	27	25 x25	16	4	C.F.M.	5,180	7,320	8,990	10,350	11,600	12,700	14,620	16,400	17,950
						R.P.M.	276	389	477	550	615	674	777	870	953
						B.H.P.	88	2.53	4.60	7.05	9.89	13.00	19.95	27.95	36.75
80	48	30½	27 x27	18	4	C.F.M.	6,250	8,850	10,860	12,500	14,000	15,350	17,700	19,800	21,700
						R.P.M.	241	341	418	482	538	591	682	762	836
						B.H.P.	1.07	3.03	5.55	8.53	11.95	15.70	24.15	33.75	44.40
90	54	34½	31 x31	20	5	C.F.M	8,300	11,700	14,320	16,550	18,550	20,250	23,400	26,175	28,650
						R.P.M.	215	303	372	428	480	525	606	678	742
						B.H.P.	1.42	4.00	7.33	11.30	15.85	20.70	31.90	44.60	58.60
100	60	38	34 x34	22	6	C.F.M.	10,100	14,280	17,500	20,200	22,600	24,680	28,600	31,900	35,000
						R.P.M.	193	273	334	386	432	472	546	610	668
						B.H.P.	1.72	4.87	8.95	13.75	19.30	25.12	39.00	54.40	71.60
110	66	42	37½x37½	24	6	C.F.M.	12,365	17,530	21,400	24,720	27,700	30,390	35,190	39,200	42,900
						R.P.M	175	248	303	350	392	430	497	554	607
						B.H P.	2.11	6.00	10.78	16.85	23.61	31.05	48.00	66.80	87.80
120	72	46	41 x41	26	6	C.F.M.	14,950	21,070	25,800	29,800	33,210	36,500	42,250	47,150	51,600
						R.P.M.	161	227	278	321	358	393	455	508	556
						B.H.P.	2.55	7.20	13 20	20.30	28.35	37.35	57.65	80.40	105.60
130	78	49½	44 x44	28	6	C.F.M.	17,300	24,550	30,080	34,750	38,810	42,600	49,150	54,900	60,200
						R.P.M.	148	210	257	297	332	364	420	470	514
						B.H.P.	2.95	8.40	15.35	23.70	33.10	43.50	67.00	93.70	123.20
140	84	53½	48 x48	30	7	C.F M.	20,525	29,000	35,525	41,100	45,800	50,250	57,950	64,750	71,150
						R.P.M	138	195	239	276	308	338	390	436	478
						B.H.P	3.05	9.91	18.20	28.05	39.10	51.35	79.00	110.50	145.80
160	96	60	54 x54	32	8	C.F.M	25,800	36,425	44,800	51,600	57,750	63,150	73,150	81,600	89,200
						R.P.M.	121	171	210	242	271	296	343	383	418
						B.H P.	4 40	12.46	22.90	35.20	49.25	64.50	99.80	139.00	182.60
180	108	68	60 x60	36	8	C.F.M.	32,400	46,000	56,350	65,150	72,700	79,900	92,100	103,000	112,500
						R.P M.	107	152	186	215	240	264	304	340	372
						B.H.P.	5.52	15.73	28.80	44.50	62.00	82.5	125.60	175.60	230.00
200	120	76	66 x66	40	10	C.F.M.	39,900	56,600	69,150	79,800	89,500	97,800	113,100	126,500	138,600
						R.P.M.	96	136	166	192	215	235	272	304	333
						B.H.P.	6.80	19.35	35.40	54.40	76.35	100.00	154.20	219.50	283.50
220	132	84	72 x72	44	12	C.F.M.	48,350	68,150	83,500	96,200	107,800	118,150	136,200	152,250	166,500
						R.P.M	88	124	152	175	196	215	248	277	303
						B.H.P.	8.23	23.15	42.75	65.60	91.80	121.00	185.80	259.50	340.50
240	144	92	78 x78	46	14	C.F.M	57,300	80,700	99,150	113,950	127,250	139,500	161,400	180,500	197,500
						R.P.M.	81	114	140	161	180	197	228	255	279
						B.H.P	9.75	27.60	50.70	77.60	108.60	142.60	220.50	307.50	404.00

Horse-power in the above table is net, no allowance having been made for belt slip, etc.

The B&B Line of Massachusetts Cone Fans

The Massachusetts cone type fan is a peripheral discharge fan and can be installed in limited spaces, requiring about the same space as the Massachusetts Davidson Fan. It delivers air against higher pressures than will the Davidson type.

The cone fan consists of a series of backward curved blades arranged about a center cone casting having its apex towards the inlet side of the wheel. Cone fans are usually installed without a casing, the air being discharged from the circumference of the wheel equally in all directions and in a plane at right angles to the axis. The floats curved backwards at a considerable angle, and the cone-shaped inlet produce a very smooth running fan.



The cone fan is largely used to save space. When it is encased in a housing it will work against medium air pressures and will handle large volumes of air. The curved blades eliminate eddy currents and shock of air and this type of fan is accordingly relatively high in efficiency.

The cone fan is largely used in theatres, hospitals and similar institutional work, where it is arranged to discharge directly into a large plenum chamber, from which emerge the various warm air ducts.

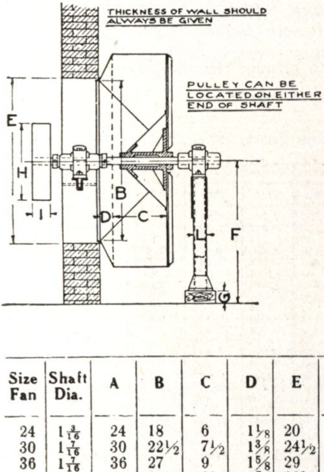
The frame and side plate of the Massachusetts Cone Fan are of steel, the blades are flanged and secured to the side plate and cone by bolts and rivets. The cone wheel may be arranged for belt drive, or may be direct connected to an engine or motor. The drive may be located on either end of the shaft.

The air is drawn by the fan from the heating chamber on one side of a division wall when this fan is used on heating and ventilating work. In this division wall there is located an inlet opening concentric with the eye of the wheel. The heated air is delivered by the fan into the plenum chamber on the other side of the division wall, and thence into the system of ducts.

The B&B Line of Massachusetts Cone Fans

Dimensions

Wall setting for standard Massachusetts cone fans.


THICKNESS OF WALL SHOULD ALWAYS BE GIVEN
PULLEY CAN BE LOCATED ON EITHER END OF SHAFT
E
H
I
B
D
C
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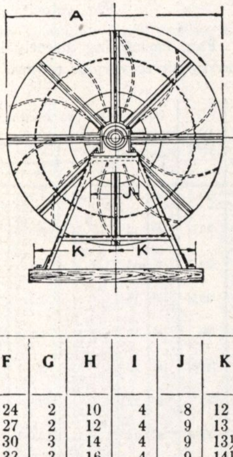


Size Fan	Shaft Dia.	A	B	C	D	E	F	G	H	I	J	K
24	1$\frac{3}{16}$	24	18	6	1⅛	20	24	2	10	4	8	12
30	1$\frac{7}{16}$	30	22½	7½	1⅜	24½	27	2	12	4	9	13
36	1$\frac{7}{16}$	36	27	9	1⅝	29	30	3	14	4	9	13½
42	1$\frac{11}{16}$	42	31½	10½	1⅞	33½	33	3	16	4	9	14¼
48	1$\frac{15}{16}$	48	36	12	2$\frac{3}{16}$	38	36	3	18	4	10	15¼
54	2$\frac{3}{16}$	54	40½	13½	2½	42½	39	3	20	4	10	16½
60	2$\frac{7}{16}$	60	45	15	2¾	47	42	4	22	6	10	17½
66	2$\frac{7}{16}$	66	49½	16½	3	51½	45	4	24	6	10	18½
72	2$\frac{11}{16}$	72	54	18	3¼	56	48	4	26	6	13	20½
84	2$\frac{15}{16}$	84	63	21	3⅞	65½	60	4	30	8	13	23½
96	3$\frac{3}{16}$	96	72	24	4⅜	74½	66	4	34	8	14	25½
108	3$\frac{7}{16}$	108	81	27	4⅞	83½	72	4	38	10	14	27
120	3$\frac{7}{16}$	120	90	30	5½	93	78	4	42	10	14	28¾
132	3$\frac{15}{16}$	132	99	33	6	102	84	6	48	12	16	30½
144	3$\frac{15}{16}$	144	108	36	6½	111	90	6	54	12	16	32

The B&B Line of Massachusetts Cone Fans

Capacities of Massachusetts Cone Fans

Free Inlet, Restricted Outlet

Dynamic Pressure in Inches of Water Gauge
For static pressure deduct 18.4%
For velocity pressure deduct 81.6%

Fan discharging directly into plenum chamber from which ducts convey air to various rooms.

Diameter of Wheel	Dia. Inlet	Pulley		FREE INLET, RESTRICTED OUTLET							
		Face	Dia.	Press	.324 in.	.433 in.	.649 in.	.865 in.	1.08 in.	1.30 in.	1.73 in.
				P. V.	3095	3575	4375	5060	5645	6190	·7145
24	20	4	10	C.F.M.	1,718	1,990	2.440	2.815	3,130	3,442	3,975
				R.P.M.	492	570	695	806	897	987	1,140
				B.H.P.	.26	.40	.73	1.13	1.56	2.08	3.24
30	24½	4	12	C.F.M.	2.680	3,110	3.800	4,370	4,880	5,370	6,210
				R.P.M.	394	457	558	644	718	789	912
				B.H.P.	.40	.64	1.14	1.78	2.44	3.24	5.03
36	29	4	14	C.F.M.	3.865	4,460	5,440	6,295	7,010	7,710	8,890
				R.P.M.	328	380	465	537	598	657	758
				B.H.P.	.59	.91	1.64	2.56	3.54	4.80	7.15
42	33½	4	16	C.F.M.	5,280	6,125	7,440	8,650	9,640	10,600	12,280
				R.P.M.	281	326	398	460	513	563	652
				B.H.P.	.79	1.24	2.25	3.48	4.82	6.40	9.76
48	38	4	18	C.F.M.	6,870	7,940	9,725	11,255	12,520	13,800	15,880
				R.P.M.	246	285	348	403	448	494	568
				B.H.P.	1.03	1.60	2.92	4.52	6.25	8.35	12.60
54	42½	4	20	C.F.M.	8,695	10,050	12,225	14,200	15.795	17,400	20,050
				R.P.M.	219	253	310	358	398	438	506
				B.H.P.	1.32	2.03	3.75	5.75	7.93	10.50	16.40
60	47	6	22	C.F.M.	10,720	12,450	15,280	17,580	19,650	21,500	24,900
				R.P.M.	197	228	279	322	360	394	456
				B.H.P.	1.64	2.52	4.65	7.10	9.90	13.0	20.02
66	51½	6	24	C.F.M.	13,000	15,050	18,300	21,280	23,620	26,100	30,100
				R.P.M.	179	207	253	293	326	359	414
				B.H.P.	1.98	3.04	5.55	8.55	11.90	15.90	24.40
72	56	6	26	C.F.M.	15,410	17,850	21,900	25,180	28.100	30,900	35,600
				R.P.M.	164	190	233	268	299	329	379
				B.H.P.	2.34	3.62	6.66	10.20	14.30	19.0	28.80
84	65½	8	30	C.F.M.	21,150	24,400	29.730	34,400	38,400	42,200	48,700
				R.P.M.	141	163	199	230	257	282	325
				B.H.P.	3.18	4.92	8.95	13.90	19.40	25.50	39.20
96	74½	8	34	C.F.M.	27,400	31,820	38,730	44,750	49,800	55,200	63,520
				R.P.M.	123	143	174	201	224	247	285
				B.H.P.	4.12	6.40	11.55	18.0	24.90	33.20	50.5
108	83½	10	38	C.F.M.	34,600	40,200	49,300	56,900	63,550	69,650	80,400
				R.P.M.	109	127	155	179	200	219	253
				B.H.P.	5.23	8.16	14.75	22.80	31.80	42.0	64.0
120	93	10	42	C.F.M.	42,850	49,300	60,600	70,300	78,600	85,800	98,600
				R.P.M.	99	114	146	161	180	197	227
				B.H.P.	6.63	10.0	18.60	28.30	39.50	51.50	78.00
132	102	12	48	C.F.M.	51,950	60,150	73500	83,420	94,480	104,400	120,400
				R.P.M.	90	104	127	146	163	179	207
				B.H.P.	7.80	12.20	22.0	33.40	46.50	61.60	95.30
144	111	12	54	C.F.M.	61,600	71,400	87,200	101,120	112,400	123.200	142,400
				R.P.M.	82	95	116	134	150	164	190
				B.H.P	9.28	14.40	26.40	43.30	57.60	74.50	116.00

The B&B Line of Massachusetts Cone Fans

Capacities of Massachusetts Cone Fans

Free Outlet, Restricted Inlet

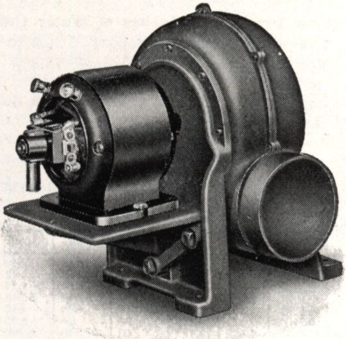
Dynamic Pressure in Inches of Water Gauge
For static pressure deduct 26.2%
For velocity pressure deduct 73.8%

Fan exhausting from plenum chamber to which ducts convey air from various rooms.

Diameter of Wheel	Dia. Inlet	Pulley		FREE OUTLET, RESTRICTED INLET							
		Face	Dia.	Press	.324 in.	.433 in.	.649 in.	.865 in.	1.08 in.	1.30 in.	1.73 in.
				P. V.	2870	3315	4075	4710	5250	5760	6660
24	20	4	10	C.F.M.	1,990	2,300	2,815	3,250	3,620	3,985	4,590
				R.P.M.	457	529	648	750	837	920	1,060
				B.H.P.	.21	.32	.58	.89	1.25	1.65	2.5
30	24½	4	12	C.F.M.	3,095	3,580	4,380	5,070	5,660	6,225	7,200
				R.P.M.	366	423	518	600	667	735	850
				B.H.P.	.32	.50	.91	1.4	1.95	2.60	3.95
36	29	4	14	C.F.M.	4,485	5,180	6,360	7,340	8,200	8,995	10,380
				R.P.M.	305	353	433	500	557	612	708
				B.H.P.	.46	.71	1.32	2.02	2.83	3.72	5.7
42	33½	4	16	C.F.M.	6,090	7,040	8,640	9,960	11,135	12,200	14,080
				R.P.M.	261	303	371	428	477	525	606
				B.H.P.	.63	.97	1.79	2.74	3.9	5.1	7.7
48	38	4	18	C.F.M.	7,950	9,200	11,300	13,050	14,570	15,960	18,420
				R.P.M.	229	265	325	375	418	458	530
				B.H.P.	.81	1.27	2.34	3.6	5.0	6.6	10.1
54	42½	4	20	C.F.M.	10,080	11,610	14,230	16,415	18,375	20,175	23,225
				R.P.M.	203	235	289	333	372	408	470
				B.H.P.	1.05	1.6	2.95	4.55	6.3	8.35	12.7
60	47	6	22	C.F.M.	12,420	14,350	17,590	20,350	22,680	24,875	28,700
				R.P.M.	183	212	259	300	335	368	423
				B.H.P.	1.3	1.97	3.64	5.78	7.8	10.3	15.75
66	51½	6	24	C.F.M.	14,920	17,380	21,275	24,585	27,380	30,100	34.620
				R.P.M.	166	193	237	273	304	335	385
				B.H.P.	1.57	2.4	4.42	6.78	9.38	12.5	19.9
72	56	6	26	C.F.M.	17,900	20,670	25,470	29,220	32,690	35,800	41,450
				R.P.M.	153	176	217	250	278	306	353
				B.H.P.	1.85	2.84	5.27	8.05	11.3	14.8	22.7
84	65½	8	30	C.F.M.	24,300	28,200	34,450	39,700	44,275	48,700	56,400
				R.P.M.	131	152	186	214	238	263	303
				B.H.P.	2.54	3.88	7.15	11.0	15.4	20.2	31.0
96	74½	8	34	C.F.M.	31.575	36,800	44,775	51,750	57,800	63,600	73,300
				R.P.M.	114	133	162	187	209	230	265
				B.H.P.	3.32	5.05	9.35	14.2	20.0	26.4	40.3
108	83½	10	38	C.F.M.	40,300	46,650	56,700	65,800	73,000	80,600	93,200
				R.P.M.	102	118	144	167	185	204	236
				B.H.P.	4.2	6.4	11.8	18.1	25.4	33.4	51.0
120	93	10	42	C.F.M.	49,750	57,500	70,400	81,350	90,650	99,200	115,000
				R.P.M.	92	106	130	150	167	183	212
				B.H.P.	5.15	7.9	14.6	22.4	31.2	41.2	63.0
132	102	12	48	C.F.M.	59,500	69,500	84,650	97,500	108,000	119,800	137,500
				R.P.M.	83	97	118	136	152	167	192
				B.H.P.	6.25	9.57	17.6	27.0	37.0	50.5	74.8
144	111	12	54	C.F.M.	71,400	82,700	101,500	117,500	130,800	143,800	165,400
				R.P.M.	76	88	108	125	139	153	176
				B.H.P	7.45	11.35	21.05	32.3	45.0	59.5	90.5

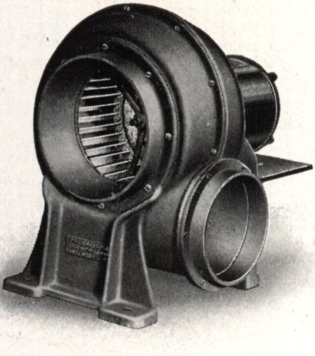
The B&B Line of Massachusetts Portable Service Sets

The Massachusetts Portable Service Sets are small squirrel cage fans ranging in size from 6-inch to 15-inch diameter wheel. The fans are built for either belt drive or direct connection to motors and are so designed that the wheel is overhung, thus giving a free and unobstructed inlet. They are of service for the ventilation of toilets, offices, residences, waiting rooms, laboratories, etc.



Portable Service Set with Direct Connected Motor

The housings and supports of these fans are of cast iron and may be arranged for either right or left hand discharge as the case may require. On direct connected sets the motors commonly employed operate at 1750 r.p.m. for the smaller sizes and at approximately 550 r.p.m. for the larger fans. Speed at which these units operate is naturally determined by the conditions of installation.



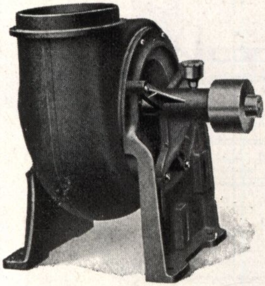
Inlet Side, Portable Service Set.

The B&B Line of Massachusetts Portable Service Sets

Single phase, polyphase, alternating current or direct current motors can be supplied with Massachusetts Portable Service Sets Speed regulators can be furnished with direct current motors, conveniently mounted along side the motor driving the fan. These blowers are exceptionally quiet in operation at high speeds.

In considering any fan problem it is desirable to know the following elements:

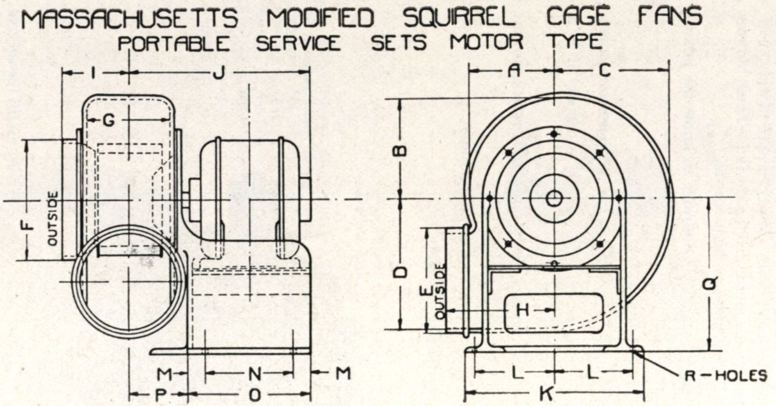
1. Volume of air the fan is to deliver.
2. Resistance or static pressure that the fan will operate against.
3. The temperature of the air it will handle, especially if it is over 100 degrees Fahrenheit.
4. The type of motive power most advisable, alternating current motor, direct current motor, or belt drive.
5. Restrictions as to space that the fan can occupy.
6. Restrictions as to the power supply.



The Massachusetts Portable Service Sets are very useful for service on doubtful problems, their size and portability allow the user to install on a ventilating problem of temporary consideration, and to use these sets either permanently or temporarily as required.

The capacities and power requirements for the B&B Line of Massachusetts Portable Service Sets are shown in Table of Capacities on the following page.

The B&B Line of Massachusetts Portable Service Sets


MASSACHUSETTS MODIFIED SQUIRREL CAGE FANS
PORTABLE SERVICE SETS MOTOR TYPE
I
J
G
F
OUTSIDE
M
N
M
P
O
A
C
B
D
E
OUTSIDE
H
Q
L
L
K
R-HOLES

Size Fan	W'le Dia.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Wt.
60-00	6″	3 15/16	4⅝	5 5/16	6	4 11/16	6 7/16	4	5 9/16	3	11 5/16	10½	4⅝	1¼	5½	8	3 5/16	8	9/16	75
00-81	8¼	5 7/16	6⅜	7 5/16	8¼	6⅜	8½	5½	7 1/16	4 9/16	13 1/16	12⅝	5 11/16	1¼	6½	9	4 1/16	10	9/16	100
0-10½	10½	7⅛	8½	9⅞	11¼	8 11/16	11⅝	7	8¾	5⅜	15½	15¾	7¼	1½	7½	10½	5	13	9/16	185
0-12	12	7⅞	9⅝	11⅜	13⅛	10	13	8	9½	5⅞	17⅝	17 15/16	8 3/16	1½	9	12	5⅝	13⅝	9/16	220
0-15	15	9¾	12	14¼	16½	12½	16	10	11¾	7 3/16	18¾	21⅝	10	1½	9	12	6¾	18½	9/16	330

The B&B Line of Massachusetts Portable Service Sets

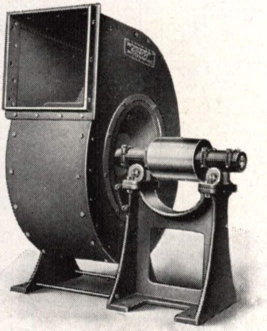
CAPACITY TABLES OF PORTABLE SERVICE SETS

Size Fan	RPM	Free Delivery		⅛″ Static		¼″ Static		½″ Static		¾″ Static		1″ Static		1½″ Static		2″ Static		2½″ Static	
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
00–60	1150	216	.024	175	.018	133	.014	20	.008										
	1750	330	.083	310	.078	275	.067	215	.05	158	.042	40	.028						
	2250	422	.185	400	.180	380	.170	340	.145	285	.12	250	.105	117	.07				
00–81	850	415	.05	345	.038	260	.028	25	.018										
	1150	560	.12	515	.11	455	.095	325	.07	146	.05								
	1750	850	.41	780	.39	780	.37	700	.33	630	.29	560	.25	390	.19	70	.15		
0–10½	700	800	.12	730	.10	620	.081	300	.06										
	850	1120	.21	920	.19	820	.17	720	.13	565	.11	300	.08						
	1150	1310	.48	1260	.46	1210	.45	1110	.39	840	.34	710	.31	410	.24				
	1750	2230	1.96	2100	1.89	1920	1.70	1860	1.72	1740	1.56	1690	1.42	1080	.85	635	.77		
0–12	700	1260	.20	1090	.17	935	.14	580	.095										
	850	1525	.37	1470	.34	1280	.30	1000	.23	670	.165								
	1150	2070	.90	2000	.88	1950	.83	1700	.70	1450	.63	1245	.53	662	.36				
	1750	3150	3.20	3100	3.17	3000	3.10	2950	3.0	2825	2.85	2640	2.56	2400	2.3	2100	2.0	1790	1.73
0–15	700	2470	.63	2320	.580	2070	.50	1675	.39	1200	.30	320	.215						
	850	3000	1.15	2850	1.12	2730	1.04	2310	.83	2080	.73	1620	.585	330	.37				
	1150	4050	2.8	4000	2.78	3880	2.65	3630	2.50	3350	2.20	3100	1.96	2580	1.65	1970	1.35	970	1.0

The B&B Line of Massachusetts Exhausters

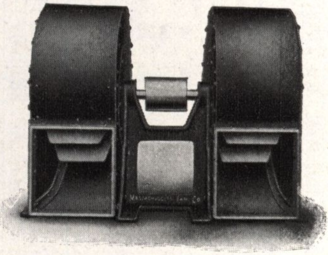
The Massachusetts Exhausters are designed for the handling of materials such as shavings, sawdust, emery dust, grains, etc. The housings are of extra heavy steel plate to withstand the abrasive action of the material handled. The construction of the wheel permits of the handling of long, stringy materials without clogging.

The wheel is overhung on the end of the shaft, thus leaving the inlet entirely unobstructed for the free passage of the material to be handled. There are no exposed bearings, hence the Massachusetts Exhausters are well adapted for other service than handling materials such as hot air, smoke and steam.



Single Exhaust Type

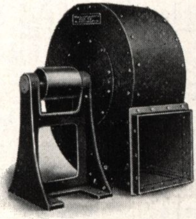
The Massachusetts Exhausters are of the universal type, interchangeable for any hand and discharge, and are made both in single and double designs. The double type of planing mill exhauster is used where the piping extends in opposite directions. It permits of direct connection to the inlets without the use of elbows.



Double Type

The B&B Line of Massachusetts Exhausters

In the design of an exhausting system the exhauster should be placed as near to the heaviest work as practical, and at the same time be located to serve all the machines to which it may be connected. If the machines are far apart it is better to increase the number of exhausters. When the duct branches exceed 50 or 60 feet in length it is far better design to use an extra exhauster and avoid such distances and to give consideration to double exhausters.



The power required to produce a required suction throughout any exhaust system depends upon the total resistance of the system and the efficiency of the exhauster. The resistance encountered is represented in the following elements:

1. The resistance due to pipe friction.
2. The loss at junctions of the pipes.
3. The back pressure imposed by a collector.

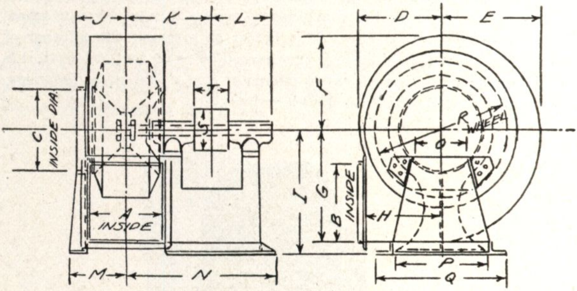
Consideration must in turn be given of the physical nature of the materials handled, not so much for the resistance imposed but from an abrasive and clogging viewpoint. Thus experience alone can give definite information and design exhausting systems for shavings and sawdust, emery dust, leather chips, leather dust, buffing wheel lint, grains, powdered chemicals, etc., etc. The Massachusetts Exhausters have been designed with such information at their disposal.

The Massachusetts Exhauster construction is for strength and racking is prevented, unusually long life is assured even in contact with highly abrasive materials. The cast iron support used on the single type, attached to the outside of the shell carries the ring oiling boxes with the shaft and pulley, thereby taking the entire strain on the mechanism. On the double type these supports are located between the two units

The B&B Line of Massachusetts Exhausters

Dimensions

Massachusetts Single Exhausters



Size Fan	Shaft Dia.	A	B	C	D	E	F	G	H	I	J
30	1$\frac{5}{16}$	11	11	12	12½	15	13¾	16¼	11¾	18	7¼
35	1$\frac{7}{16}$	13	13	13¾	14½	17½	16	19	13½	20⅞	8⅝
40	1$\frac{11}{16}$	14¼	14¼	15⅝	16½	20	18¼	21¾	15	23¾	9¼
45	1$\frac{15}{16}$	16	16	17⅝	18½	22½	20½	24½	17	26¾	10¼
50	1$\frac{15}{16}$	17¾	17¾	19¾	20½	25	22¾	27¼	18½	29⅞	11⅛
55	2$\frac{3}{16}$	19½	19½	21⅝	22½	27½	25	30	20½	32¾	12
60	2$\frac{3}{16}$	21¼	21¼	23⅝	25	30½	27¾	33¼	22½	35¾	12⅞

Size Fan	Shaft Dia.	K	L	M	N	O	P	Q	R	S	T
30	1$\frac{5}{16}$	12¾	8¾	8¾	20	7	14	16	20	6	5
35	1$\frac{7}{16}$	15	10½	9¾	26¼	9	15⅞	23	23	7	6
40	1$\frac{11}{16}$	16¾	12¼	11⅜	29⅛	9	17¾	24¼	27	8	7
45	1$\frac{15}{16}$	19¼	14	12¼	33¾	10	20¼	27	30	9	8
50	1$\frac{15}{16}$	20⅝	14½	13⅛	35⅝	10	22¾	29	33	10	9
55	2$\frac{3}{16}$	22½	16	14	39	10	24¾	31½	36	11	10
60	2$\frac{3}{16}$	23⅞	16½	14⅞	40⅞	10	26¾	33	40	12	11

The B&B Line of Massachusetts Exhausters

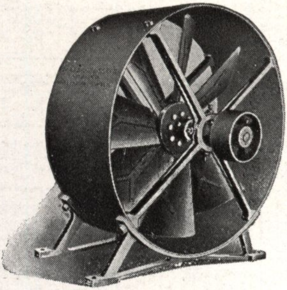
CAPACITIES, SPEEDS AND HORSE POWERS OF MASSACHUSETTS STANDARD PLANING MILL EXHAUST FANS

Size of Fan	Dia. of Wheel	Inside Dia. Inlet	Size Outlet	Pulley		Static Pressure	½ oz. .865″	¾ oz. 1.297″	1 oz. 1.73″	1½ oz. 2.595″	2 oz. 3.46″	2½ oz. 4.325″	3 oz. 5.19″	3½ oz. 6.055″	4 oz. 6.92″
				Face	Dia.	P.V.	4360	5340	6170	7560	8720	9760	10750	11600	12350
30	20	12	11 x 11	5	6	R.P.M.	835	1,025	1,180	1,442	1,670	1,870	2,041	2,210	2,360
						C.F.M.	1,330	1,610	1,860	2,280	2,630	2,940	3,220	3,480	3,720
						B.H.P.	.45	.83	1.25	2.25	3.55	4.9	6.4	8.2	10.0
35	23	13¾	13 x 13	6	7	R.P.M.	726	888	1,025	1,256	1,450	1,622	1,776	1,918	2,050
						C.F.M.	1,850	2,270	2,620	3,210	3,700	4,140	4,540	4,900	5,240
						B.H.P.	.62	1.14	1.75	3.23	4.95	6.93	9.1	11.4	14.0
40	27	15⅝	14¼ x 14¼	7	8	R.P.M.	618	756	873	1,070	1,235	1,380	1,512	1,632	1,745
						C.F.M.	2,300	2,830	3,250	3,980	4,600	5,140	5,630	6,080	6,500
						B.H.P.	.78	1.43	2.2	4.05	6.25	8.7	11.4	14.4	17.6
45	30	17⅝	16 x 16	8	9	R.P.M.	555	680	785	962	1,110	1,240	1,360	1,470	1,570
						C.F.M.	2,970	3,640	4,200	5,150	5,940	6,640	7,280	7,860	8,400
						B.H.P.	1.05	1.86	2.85	5.25	8.1	11.3	14.9	18.8	23.0
50	33	19¾	17¾ x 17¾	9	10	R.P.M.	505	618	714	874	1,010	1,130	1,237	1,336	1,430
						C.F.M.	3,710	4,550	5,250	6,430	7,420	8,300	9,100	9,820	10,500
						B.H.P.	1.25	2.3	3.53	6.5	10.0	14.0	18.4	23.2	28.5
55	36	21⅝	19½ x 19½	10	11	R.P.M.	464	566	654	802	925	1,004	1,134	1,224	1,310
						C.F.M.	4,570	5,600	6,470	7,920	9,150	10,230	11,200	12,100	12,950
						B.H.P.	1.55	2.82	4.35	8.05	12.3	15.8	22.7	28.5	35.0
60	40	23⅝	21¼ x 21¼	11	12	R.P.M	417	510	590	723	835	932	1,022	1,100	1,180
						C.F.M.	5,480	6,700	7,740	9,480	10,950	12,250	13,420	14,500	15,500
						B.H.P.	1.84	3.36	5.2	9.6	14.8	20.5	27.0	33.8	41.5

The B&B Line of Massachusetts Disc Fans

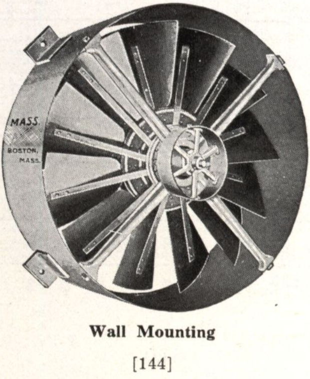
Massachusetts Disc Fans are recommended for moving large volumes of air at low pressures. They should not be installed with any great length of duct system. They are strongly built, self contained ventilating units, easily installed and easily moved from one location to another. They are correctly designed and built to withstand the most service in the industrial fields. For mining work they are of more than ordinary consideration and service.

A Massachusetts Disc Fan consists of a substantial hub into which are cast radial steel arms to which the steel plate blades are rigidly attached. The independent wheel is enclosed in a substantial circular frame, having two self oiling bearings, pulley and supporting feet as illustrated below. Wall and floor mountings can be furnished if required, and as illustrated in the cuts.



Floor Mounting

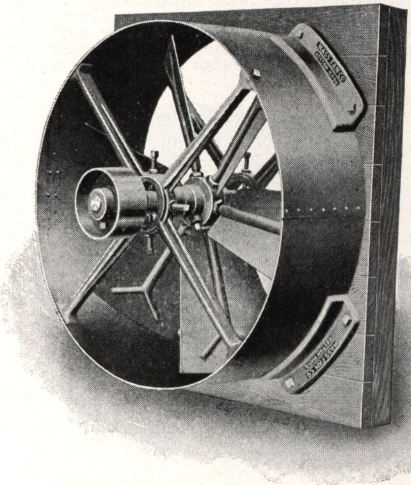
The inclined planes of the blades force air through the fan in lines horizontal to the axis of the shaft. By reversing this angle of the blades, or the direction of rotation, the air flow is reversed. The Massachusetts Disc Fan is made for both direct or pulley drive from motor or engine. Chain or geared drives can be supplied as special equipment, and portable, direct connected units can be designed for mining and similar industrial requirements.



Wall Mounting

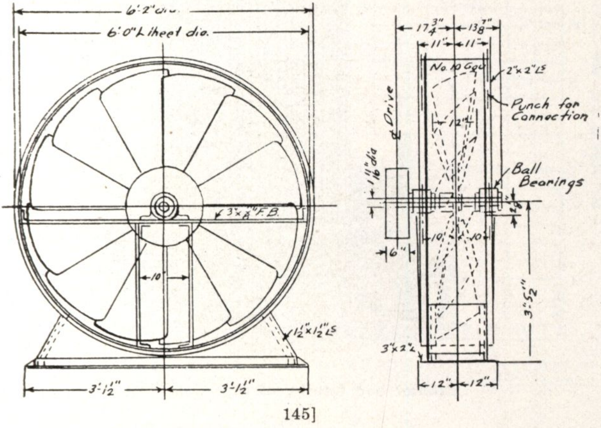
The B&B Line of Massachusetts Disc Fans

The Massachusetts Disc Fans are of service for all exhausting and ventilating work where ducts are not required. Large volumes of air against relatively low resistance are their characteristics, and they are thus of great service in shops, offices and factories to remove foul air. Industrially they are useful in dye houses, bleacheries, paper mills, etc., to remove steam, moist air, dust and odors. They can, as illustrated, be designed to stand or set on the floor, to be mounted on a wall, or be set in board mounting for sidewall installation.



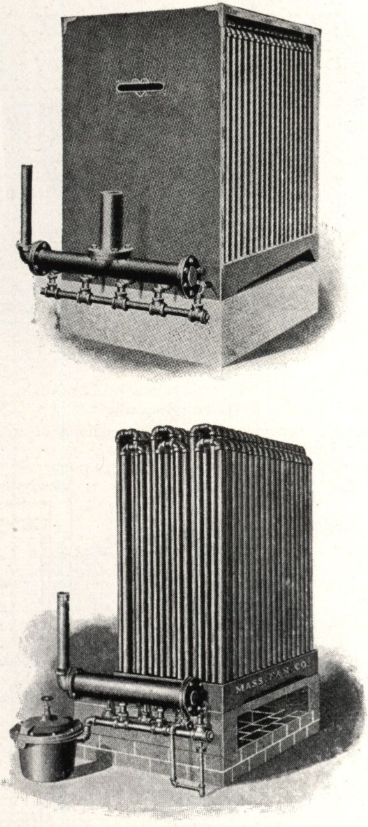
Board Mounting

The following cut gives typical dimensions of a Massachusetts Disc Fan, for ventilation service.



The B&B Line of Massachusetts Pipe Coil Heaters

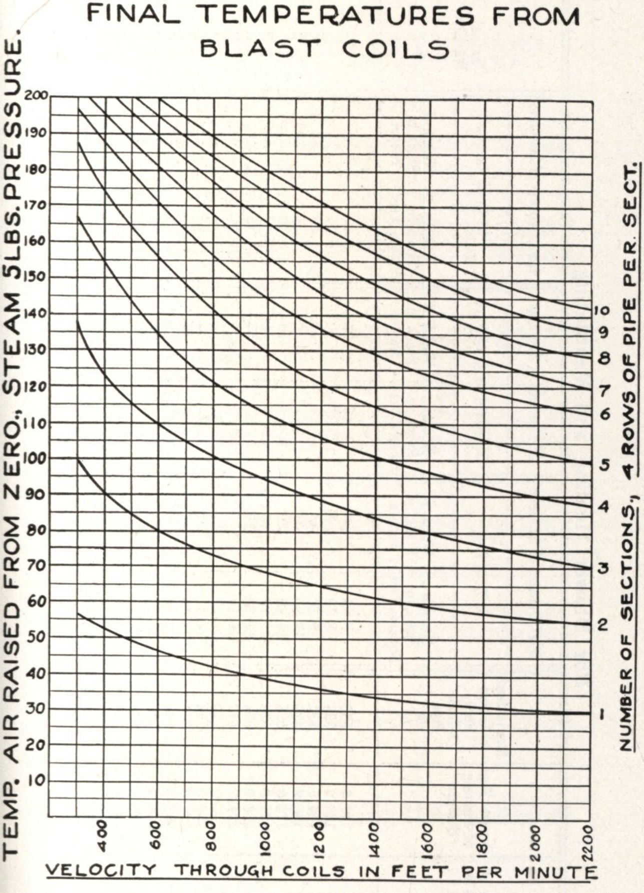
The Massachusetts Pipe Coil Heaters, often known as Return Bend Heaters, are popular for hot blast heating, drying, and similar usage, because of their great efficiency. In these heaters the pipes are spaced further apart than in the mitre coil and other types of pipe coil heaters, thus giving a large free area for the flow of air. The pipes being staggered insures of the thorough breaking up of air currents, better contact of the air with the heating surface results, and the combination of free passage and thorough heating of the air takes place.



Exterior and Interior of Pipe Coil Heater

The B&B Line of Massachusetts Pipe Coil Heaters

The temperature rise in air passing through Massachusetts Standard Pipe Coil Heaters for various conditions is shown in the following curves.


FINAL TEMPERATURES FROM BLAST COILS

NOTE:–TEMPERATURE WILL INCREASE 10% IF STEAM PRESSURE IS 20 LBS. 20% FOR 40 LBS. 30% FOR 60 LBS.

Vento Heaters

Regular Sections—Ratings and Free Areas

60″ Section (Steam or Water)—16 Square Feet.

Height 60$\frac{11}{16}$″. Width 9⅛″.

For Blower Heating and Ventilating

Number of Sections in Stack	Square Feet of Heating Surface	Equivalent in Lineal Feet 1-Inch Pipe	5⅜″ Centers of Sections		5″ Centers of Sections		4⅝″ Centers of Sections		Actual Weights
			52% of Face		Standard 44% of Face		37% of Face		
			Net Air Space in Square Feet	Width of Stack in Inches	Net Air Space in Square Feet	Width of Stack in Inches	Net Air Space in Square Feet	Width of Stack in Inches	
7	112.0	336	7.62	38	6.45	35	5.47	32	8.20 lbs. per sq. ft. actual 9 lbs. per sq. ft. shipping weight
8	128.0	384	8.70	43	7.37	40	6.25	37	
9	144.0	432	9.77	48	8.29	45	7.03	42	
10	160.0	480	10.85	54	9.21	50	7.81	46	
11	176.0	528	11.93	59	10.13	55	8.59	51	
12	192.0	576	13.00	65	11.05	60	9.37	55	
13	208.0	624	14.08	70	11.97	65	10.15	60	
14	224.0	672	15.15	75	12.89	70	10.93	65	
15	240.0	720	16.23	81	13.81	75	11.71	69	
16	256.0	768	17.31	86	14.73	80	12.49	74	
17	272.0	816	18.39	91	15.65	85	13.27	79	
18	288.0	864	19.46	97	16.57	90	14.05	83	
19	304.0	912	20.54	102	17.50	95	14.83	88	
20	320.0	960	21.62	108	18.42	100	15.61	92	
21	336.0	1008	22.70	113	19.34	105	16.39	97	
22	352.0	1056	23.78	118	20.26	110	17.17	102	
23	368.0	1104	24.85	124	21.18	115	17.95	106	
24	384.0	1152	25.93	129	22.10	120	18.73	111	

Vento Heaters

Regular Sections—Ratings and Free Areas

72″ Section (For Steam or Water)—19 Square Feet.
Height 72$\frac{3}{32}$″. Width 9⅛″.

For Blower Heating and Ventilating

Number of Sections in Stack	Square Feet of Heating Surface	Equivalent in Lineal Feet 1-Inch Pipe	5⅜″ Centers of Sections		5″ Centers of Sections		4⅝″ Centers of Sections		Actua Weights
			52% of Face		Standard 44% of Face		37% of Face		
			Net Air Space in Square Feet	Width of Stack in Inches	Net Air Space in Square Feet	Width of Stack in Inches	Net Air Space in Square Feet	Width of Stack in Inches	
7	133	399	9.14	38	7.74	35	6.56	32	8.20 lbs. per sq. ft. actual 9 lbs. per sq. ft. shipping weight
8	152	456	10.44	43	8.85	40	7.50	37	
9	171	513	11.72	48	9.95	45	8.45	42	
10	190	570	13.03	54	11.04	50	9.37	46	
11	209	627	14.31	59	12.17	55	10.30	51	
12	228	684	15.60	65	13.27	60	11.25	55	
13	247	741	16.90	70	14.35	65	12.18	60	
14	266	798	18.19	75	15.46	70	13.11	65	
15	285	855	19.49	81	16.58	75	14.06	69	
16	304	912	20.78	86	17.70	80	14.99	74	
17	323	969	22.07	91	18.78	85	15.92	79	
18	342	1026	23.34	97	19.88	90	16.86	83	
19	361	1083	24.64	102	21.00	95	17.80	88	
20	380	1140	25.95	108	22.10	100	18.73	92	
21	399	1197	27.25	113	23.20	105	19.67	97	
22	418	1254	28.52	118	24.31	110	20.60	102	
23	437	1311	29.80	124	25.40	115	21.54	106	
24	456	1368	31.10	129	26.50	120	22.47	111	

Final Temperatures and Condensations

Regular Section—Standard Spacing, 5″ Centers of Sections—Steam 227°, 5 lbs. Gauge.

Air entering above zero.

Number of Stacks Deep	Temperature of Entering Air	VELOCITY THROUGH HEATER IN FEET PER MINUTE—MEASURED AT 70°																					
		100		120		200		600		800		1000		1200		1400		1600		1800		2000	
		Final Temp. Air Leaving Heater	Cond. Lbs. per Sq. Ft. per Hour	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.
1	20	87	.43	83	.48	75	.70	58	1.46	54	1.75	51	1.99	49	2.23	47	2.42	45	2.56	43	2.65	42	2.82
	30	93	.40	89	.45	81	.65	66	1.39	62	1.64	60	1.92	58	2.17	56	2.33	54	2.46	52	2.54	51	2.69
	40	100	.38	96	.43	88	.62	74	1.31	70	1.54	68	1.80	66	2.00	64	2.16	62	2.26	61	2.42	60	2.56
	60	112	.33	109	.38	102	.54	90	1.15	86	1.34	84	1.54	82	1.69	81	1.89	80	2.05	79	2.19	78	2.31
	70	118	.31	115	.35	109	.50	97	1.04	94	1.23	92	1.41	90	1.54	89	1.71	88	1.85	87	1.96	86	2.05
2	20	129	.35	124	.40	112	.59	87	1.29	81	1.57	76	1.80	72	2.00	69	2.20	66	2.36	64	2.54	62	2.69
	30	133	.33	129	.38	117	.56	93	1.21	87	1.46	83	1.70	79	1.89	76	2.06	73	2.21	71	2.37	69	2.50
	40	137	.31	133	.36	121	.52	100	1.15	94	1.39	90	1.60	86	1.77	83	1.93	81	2.10	79	2.27	77	2.37
	60	145	.27	142	.32	131	.46	112	1.00	107	1.21	103	1.38	100	1.54	98	1.71	96	1.85	94	1.96	92	2.05
	70	149	.25	146	.29	136	.42	118	.92	114	1.13	110	1.28	107	1.42	105	1.57	103	1.69	101	1.79	100	1.92
3	20	157	.29	152	.34	139	.51	110	1.15	103	1.42	97	1.65	92	1.85	88	2.06	85	2.22	82	2.38	79	2.52
	30	160	.28	155	.32	142	.48	115	1.09	108	1.33	103	1.56	98	1.75	94	1.91	91	2.08	88	2.23	85	2.35
	40	163	.26	158	.30	146	.45	121	1.04	114	1.26	109	1.47	104	1.64	100	1.79	97	1.95	94	2.08	92	2.22
	60	168	.23	164	.27	153	.40	131	.91	124	1.09	120	1.28	116	1.44	113	1.58	110	1.71	108	1.85	106	1.97
	70	170	.21	167	.25	156	.37	136	.85	130	1.03	126	1.20	122	1.34	119	1.46	116	1.57	114	1.69	112	1.80
4	20	......	......	...	...	...	...	130	1.06	122	1.31	115	1.52	110	1.73	105	1.91	101	2.08	97	2.22	94	2.37
	30	......	......	...	...	...	...	134	1.00	126	1.23	120	1.44	115	1.63	110	1.80	106	1.95	102	2.08	99	2.21
	40	......	......	...	...	...	...	138	.94	130	1.15	124	1.35	119	1.52	115	1.68	111	1.82	108	1.96	105	2.08
	60	......	......	...	...	...	...	146	.83	139	1.01	134	1.19	129	1.33	125	1.46	122	1.59	119	1.70	117	1.83
	70	......	......	...	...	...	...	150	.77	143	.94	138	1.09	134	1.23	131	1.37	128	1.49	125	1.59	123	1.70

Final Temperatures and Condensations

Regular Section—Standard Spacing, 5″ Centers of Sections—Steam, 227°, 5 lbs. Gauge

Air entering above zero

Number of Stacks Deep	Temperature of Entering Air	VELOCITY THROUGH HEATER IN FEET PER MINUTE—MEASURED AT 70°																					
		100		120		200		600		800		1000		1200		1400		1600		1800		2000	
		Final Temp Air Leaving Heater	Cond. Lbs. per Sq. Ft per Hour	F. T.	C.	F. T.	C.	F. T	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C
5	20	...	...	...	...	...	...	144	.95	136	1.19	130	1.41	124	1.60	119	1.78	114	1.93	110	2.08	107	2.23
	30	...	...	...	...	...	...	148	.91	140	1.13	134	1.33	128	1.51	123	1.67	118	1.80	115	1.96	112	2.10
	40	...	...	...	...	...	...	151	.85	144	1.07	138	1.26	132	1.42	127	1.56	123	1.70	120	1.85	117	1.98
	60	...	...	...	...	...	...	158	.75	151	.93	145	1.09	140	1.23	136	1.36	133	1.50	130	1.62	127	1.72
	70	...	...	...	...	...	...	162	.71	155	.87	149	1.01	144	1.14	141	1.27	138	1.40	135	1.50	132	1.59
6	20	...	...	...	...	...	...	156	.87	148	1.10	142	1.30	136	1.49	130	1.65	126	1.81	122	1.96	118	2.09
	30	...	...	...	...	...	...	159	.83	151	1.04	145	1.23	139	1.40	134	1.56	130	1.71	126	1.85	122	1.97
	40	...	...	...	...	...	...	162	.78	154	.97	148	1.15	143	1.32	138	1.47	134	1.60	131	1.75	127	1.86
	60	...	...	...	...	...	...	167	.69	160	.85	155	1.02	150	1.15	146	1.29	142	1.40	139	1.52	136	1.62
	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	20	...	...	...	...	...	...	167	.81	159	1.02	152	1.21	146	1.39	141	1.55	136	1.70	132	1.85	128	1.98
	30	...	...	...	...	...	...	169	.76	161	.96	155	1.15	149	1.31	144	1.46	139	1.60	135	1.73	132	1.87
	40	...	...	...	...	...	...	171	.72	164	.91	158	1.08	153	1.24	148	1.39	143	1.51	139	1.63	136	1.76
	60	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	20	...	...	...	...	...	...	175	.75	167	.94	161	1.13	155	1.30	150	1.46	145	1.60	141	1.74	137	1.87
	30	...	...	...	...	...	...	177	.71	169	.89	163	1.07	158	1.23	153	1.38	148	1.51	144	1.64	140	1.76
	40	...	...	...	...	...	...	179	.67	171	.84	165	1.00	160	1.15	155	1.29	151	1.42	147	1.54	143	1.65
	60	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Final Temperatures and Condensations

Regular Section—Standard Spacing, 5" Centers of Sections—Steam 227°, 5 lbs. Gauge. Air entering below zero.

Number of Stacks Deep	Temperature of Entering Air	VELOCITY THROUGH HEATER IN FEET PER MINUTE—MEASURED AT 70°																					
		100		120		200		600		800		1000		1200		1400		1600		1800		2000	
		Final Temp. Air Leaving Heater	Cond. Lbs. per Sq. Ft. per Hour	F. T.	C.	F. T.	C.	F. T.	C	F. T.	C	F. T	C	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.
1	-40	52	.59	49	.68	34	.95	...	...														
	-30	58	.56	55	.65	41	.91	...	...														
	-20	64	.54	61	.62	48	.87	...	...	...	...												
	-10	70	.51	67	.59	55	.83	34	1.69	...	...	...	...	...	...	...	...	...	...	...		...	...
	0	76	.49	73	.56	62	.79	43	1.65	38	1.95	35	2.24	32	2.46	...	...	...	...			...	...
2	-40	105	.47	100	.54	83	.79	51	1.75	43	2.13	36	2.44	...	...	...	...						
	-30	109	.45	104	.52	88	.76	57	1.67	49	2.03	43	2.34	38	2.62	34	2.87	...	...	...	...	...	...
	-20	113	.43	108	.49	93	.72	63	1.60	55	1.92	49	2.22	44	2.46	40	2.69	37	2.92	34	3.12	31	3.27
	-10	117	.41	112	.47	97	.69	69	1.52	62	1.85	56	2.12	51	2.35	47	2.56	44	2.77	41	2.94	38	3.08
	0	121	.39	116	.45	102	.65	75	1.44	68	1.74	62	1.99	58	2.23	54	2.42	51	2.62	48	2.77	46	2.95
3	-40	140	.38	136	.45	119	.68	81	1.55	72	1.91	64	2.22	58	2.51	53	2.78	48	3.01	44	3.23	40	3.42
	-30	143	.37	139	.43	122	.65	86	1.49	77	1.83	70	2.14	64	2.41	58	2.63	54	2.87	50	3.08	46	3.24
	-20	146	.35	142	.42	125	.62	91	1.42	82	1.74	75	2.03	69	2.28	64	2.51	59	2.70	55	2.88	52	3.08
	-10	149	.34	145	.40	129	.59	96	1.36	87	1.66	80	1.92	75	2.18	70	2.39	66	2.60	62	2.77	58	2.90
	0	152	.33	148	.38	132	.56	101	1.30	93	1.59	86	1.84	81	2.08	76	2.27	72	2.46	68	2.62	65	2.78
4	-40	...	...	...	...	...	...	106	1.40	95	1.73	87	2.04	80	2.31	74	2.56	68	2.77	63	2.97	59	3.17
	-30	...	...	...	...	...	...	110	1.35	99	1.65	91	1.94	85	2.21	79	2.45	73	2.64	68	2.83	64	3.11
	-20	...	...	...	...	...	...	114	1.29	103	1.58	96	1.86	90	2.12	84	2.34	78	2.51	74	2.71	70	2.88
	-10	...	...	...	...	...	...	117	1.22	108	1.51	101	1.78	95	2.02	89	2.22	84	2.41	80	2.60	76	2.76
	0	...	...	...	...	...	...	121	1.16	113	1.45	106	1.70	100	1.92	95	2.13	90	2.31	86	2.48	82	2.63

Final Temperatures and Condensations

Regular Section—Standard Spacing, 5″ Centers of Sections—Steam 227°, 5 lbs. Gauge.

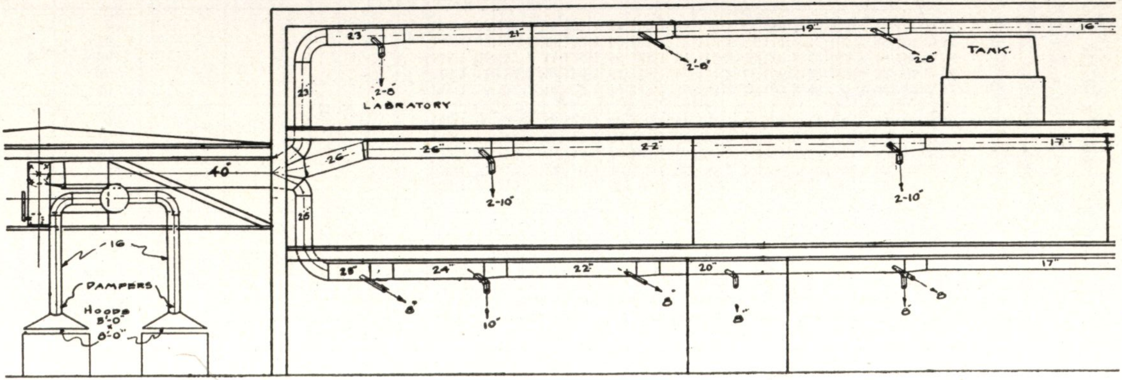
Air entering below zero.

Number of Stacks Deep	Temperature of Entering Air	VELOCITY THROUGH HEATER IN FEET PER MINUTE—MEASURED AT 70°																					
		100		120		200		600		800		1000		1200		1400		1600		1800		2000	
		Final Temp. Air Leaving Heater	Cond. Lbs. per Sq. Ft. per Hour	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.	F. T.	C.
5	-40	....	....	...	...	...	...	126	1.26	115	1.59	106	1.87	99	2.14	92	2.37	86	2.58	81	2.79	76	2.98
	-30	....	....	...	...	...	...	129	1.22	119	1.53	110	1.80	103	2.05	96	2.26	90	2.46	85	2.65	81	2.85
	-20	....	....	...	...	...	...	132	1.17	122	1.46	114	1.72	107	1.95	100	2.15	94	2.34	90	2.54	86	2.72
	-10	....	....	...	...	...	...	135	1.13	126	1.40	118	1.64	111	1.86	105	2.06	99	2.24	95	2.42	91	2.59
	0	....	....	...	...	...	...	138	1.06	129	1.32	122	1.56	115	1.77	109	1.96	104	2.14	100	2.31	96	2.46
6	-40	....	....	...	...	...	...	141	1.16	131	1.46	123	1.74	115	1.99	108	2.22	102	2.43	97	2.64	92	2.82
	-30	....	....	...	...	...	...	143	1.11	134	1.40	126	1.67	118	1.90	111	2.11	106	2.32	101	2.52	96	2.69
	-20	....	....	...	...	...	...	146	1.06	137	1.34	129	1.59	121	1.81	115	2.02	110	2.22	105	2.40	100	2.56
	-10	....	....	...	...	...	...	149	1.02	140	1.28	132	1.52	125	1.73	119	1.93	114	2.12	109	2.29	104	2.44
	0	....	....	...	...	...	...	152	.97	143	1.22	135	1.44	129	1.65	123	1.84	118	2.02	113	2.17	109	2.33
7	-40	....	....	...	...	...	...	155	1.07	146	1.36	137	1.62	129	1.86	122	2.08	116	2.28	110	2.48	105	2.66
	-30	....	....	...	...	...	...	157	1.03	148	1.31	139	1.55	131	1.77	125	1.99	119	2.18	113	2.36	109	2.55
	-20	....	....	...	...	...	...	159	.98	150	1.25	141	1.47	134	1.69	128	1.90	122	2.08	117	2.26	113	2.44
	-10	....	....	...	...	...	...	161	.94	152	1.19	144	1.41	137	1.62	131	1.81	126	1.99	121	2.16	117	2.33
	0	....	....	...	...	...	...	163	.90	154	1.13	147	1.35	140	1.54	135	1.73	130	1.90	125	2.06	121	2.22
8	-40	....	....	...	...	...	...	164	.98	155	1.25	147	1.50	140	1.73	134	1.95	128	2.15	122	2.34	117	2.52
	-30	....	....	...	...	...	...	166	.94	157	1.20	149	1.44	142	1.65	136	1.86	130	2.05	125	2.24	120	2.40
	-20	....	....	...	...	...	...	168	.90	159	1.15	151	1.37	144	1.58	138	1.77	133	1.96	128	2.14	123	2.29
	-10	....	....	...	...	...	...	170	.87	161	1.10	153	1.31	147	1.51	141	1.69	136	1.87	131	2.04	126	2.18
	0	....	....	...	...	...	...	172	.83	164	1.05	156	1.25	150	1.44	144	1.62	139	1.78	134	1.93	129	2.07

Typical Industrial Applications

Waste Heat

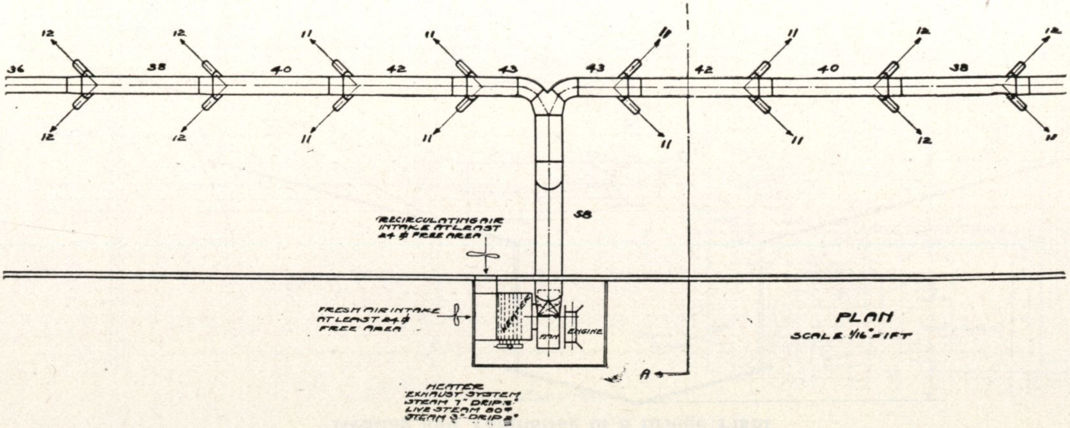
The system illustrated was installed in a carbon plant where they had retorts which were throwing off waste heat. The heat from these retorts being free from gases, dirt and dust, it was possible to gather it by means of hoods and draw it into the fan, which was located in another building. The fan distributed this heat to a three-story building adjoining. The actual cost of operating for the three-story building during the winter months was the cost of current consumed in the motor driving the fan. There are undoubtedly a number of industrial plants throughout the country where waste heat can be employed for heating. The installation of an air washer would remove dirt and dust and heated air used for heating another portion of the building.



Typical Industrial Applications

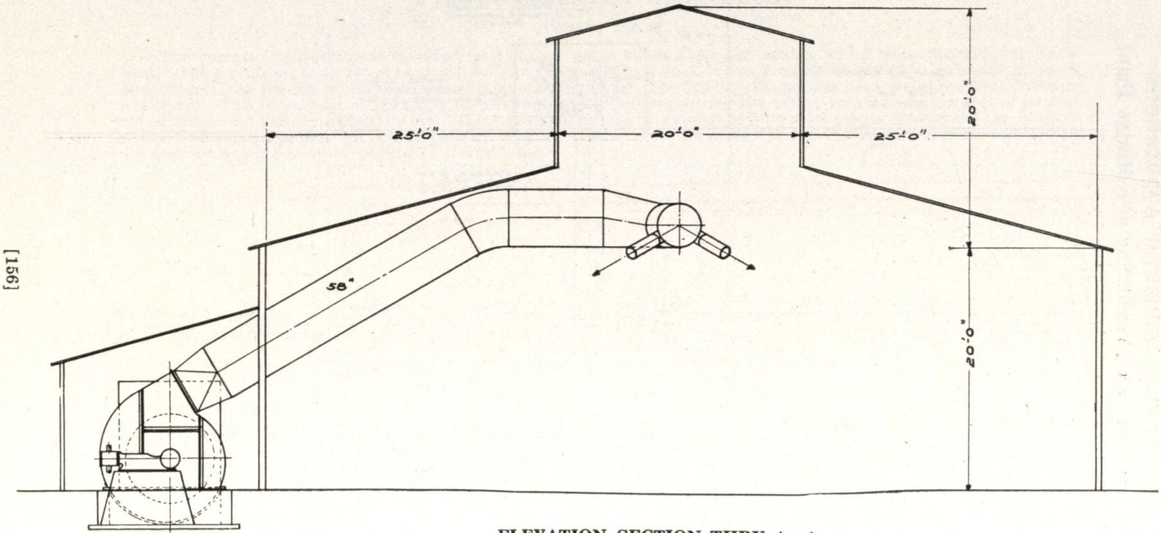
Heating and Ventilating of a Bridge Plant

The heating and ventilating system in a large bridge plant, where the walls are practically all glass with an additional lantern the length of the building which has principally glass exposure, is here illustrated. Buildings of this type are more readily adapted to the fan system of heating than to direct radiation. By recirculating the air thru the the heaters to the fan the steam consumption is small. In buildings of this description where there is a great amount of leakage, a small percentage of fresh air is taken from the outside. This insures ideal healthy atmosphere in the building which cannot be obtained by direct radiation. This system is so arranged that either all or part of the air can be taken from either the outside or the air can be recirculated from the building. In buildings of this kind it is not necessary to maintain a uniform temperature only during working hours as the temperature in the building can be easily raised to the working temperature in a very short time by recirculating the air.



Typical Industrial Applications

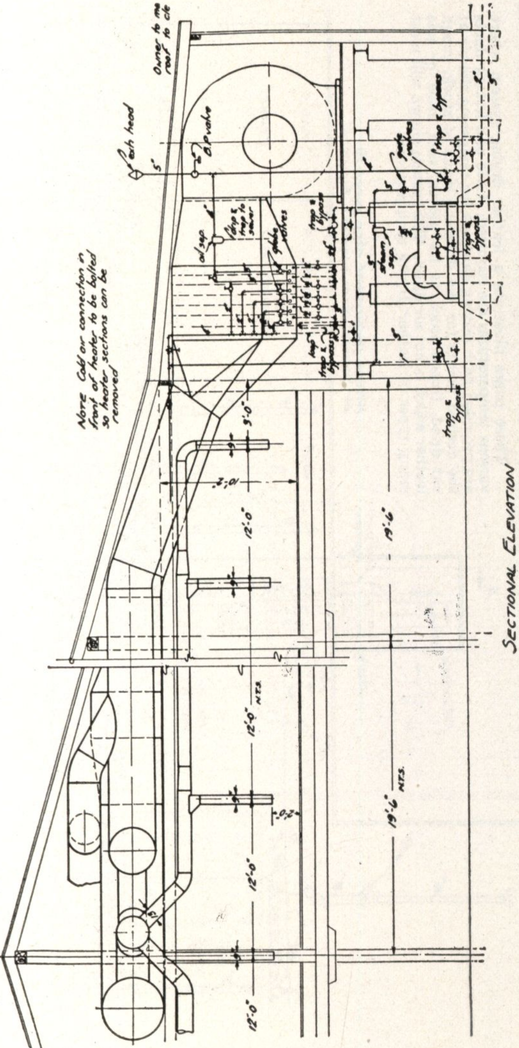
Heating and Ventilating of a Bridge Plant



ELEVATION SECTION THRU A—A
Scale ⅛-in.=1 ft.

Typical Industrial Applications

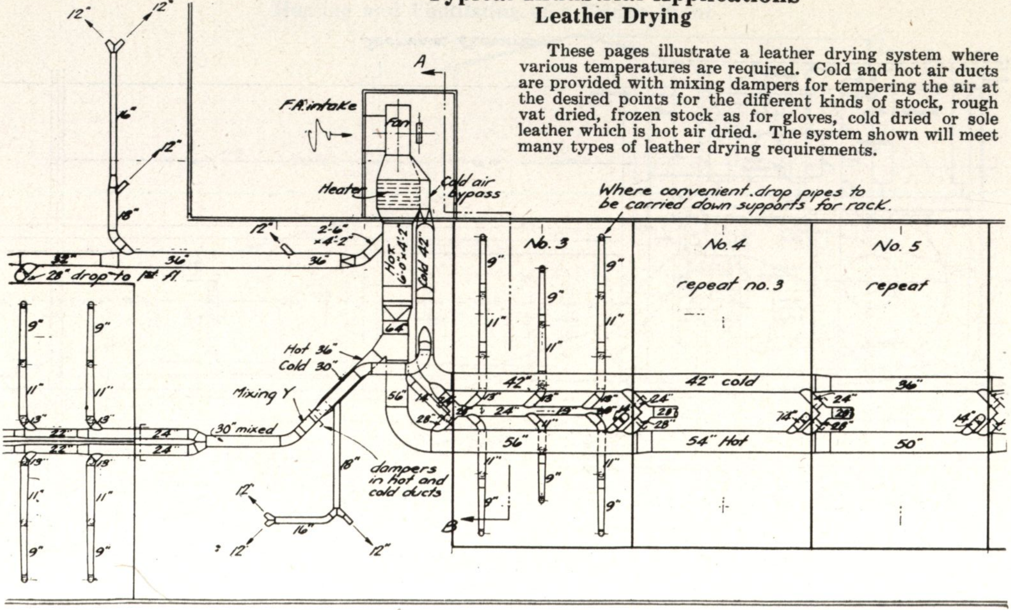
Leather Drying



SECTIONAL ELEVATION

Typical Industrial Applications
Leather Drying

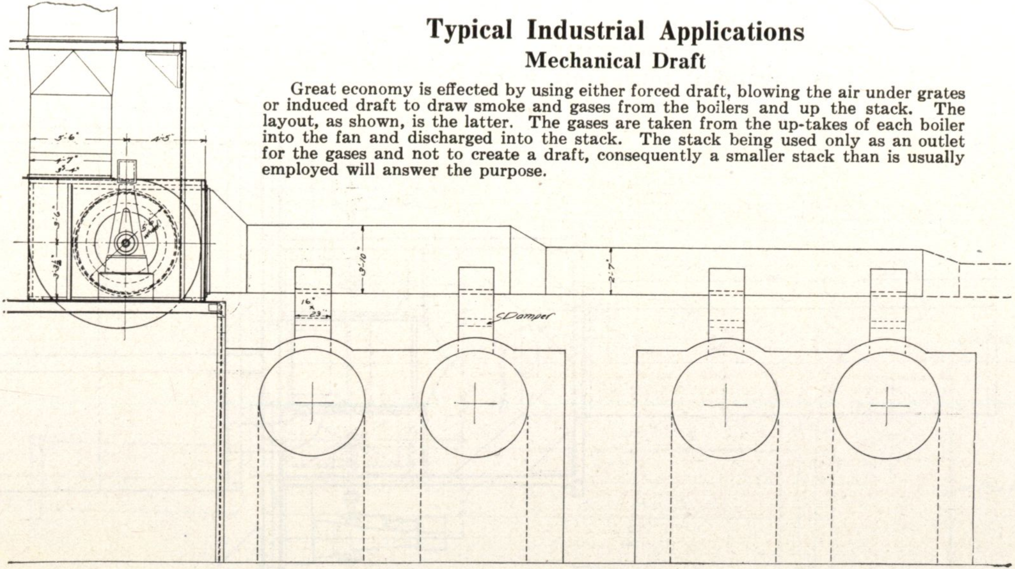
These pages illustrate a leather drying system where various temperatures are required. Cold and hot air ducts are provided with mixing dampers for tempering the air at the desired points for the different kinds of stock, rough vat dried, frozen stock as for gloves, cold dried or sole leather which is hot air dried. The system shown will meet many types of leather drying requirements.

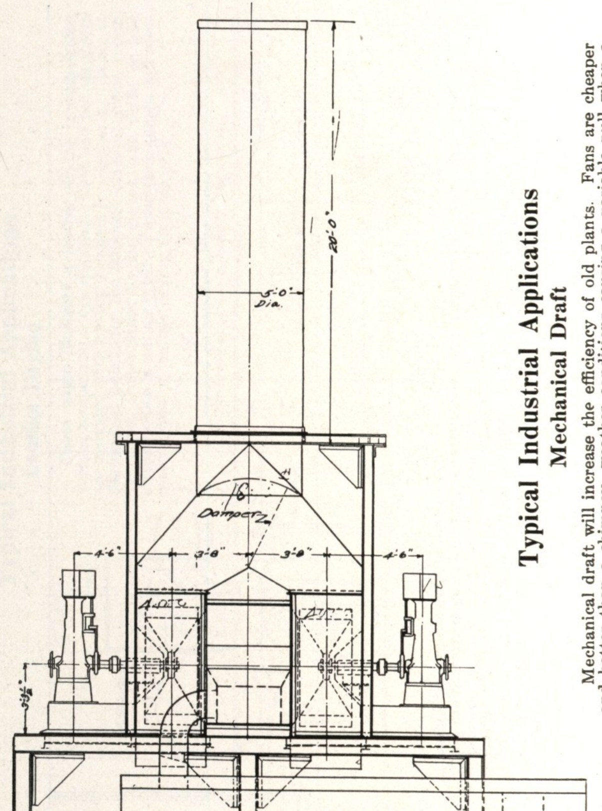


Typical Industrial Applications

Mechanical Draft

Great economy is effected by using either forced draft, blowing the air under grates or induced draft to draw smoke and gases from the boilers and up the stack. The layout, as shown, is the latter. The gases are taken from the up-takes of each boiler into the fan and discharged into the stack. The stack being used only as an outlet for the gases and not to create a draft, consequently a smaller stack than is usually employed will answer the purpose.





Typical Industrial Applications

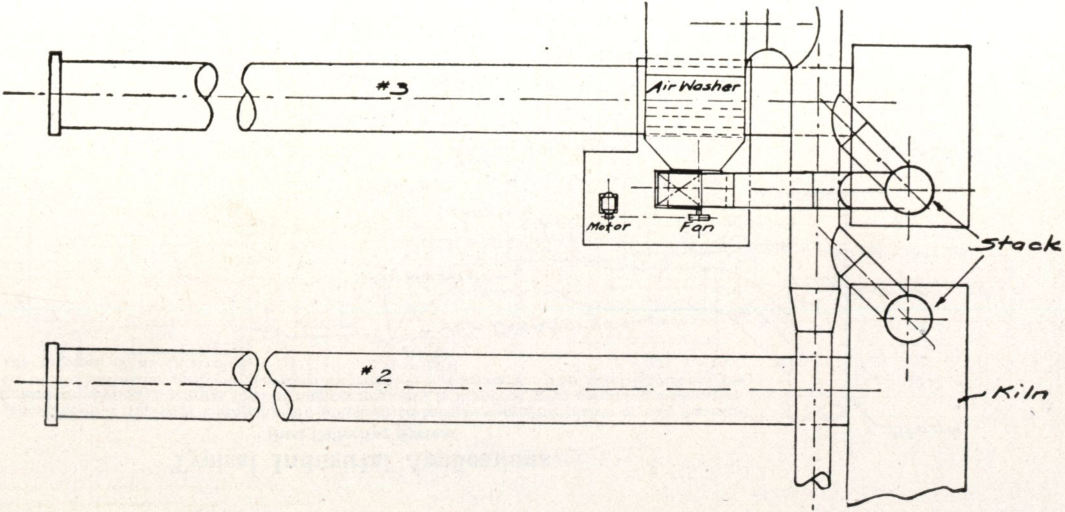
Mechanical Draft

Mechanical draft will increase the efficiency of old plants. Fans are cheaper and better than a chimney, weather conditions causing a variable pull when a chimney is used for draft.

Typical Industrial Applications

Dust Collecting System

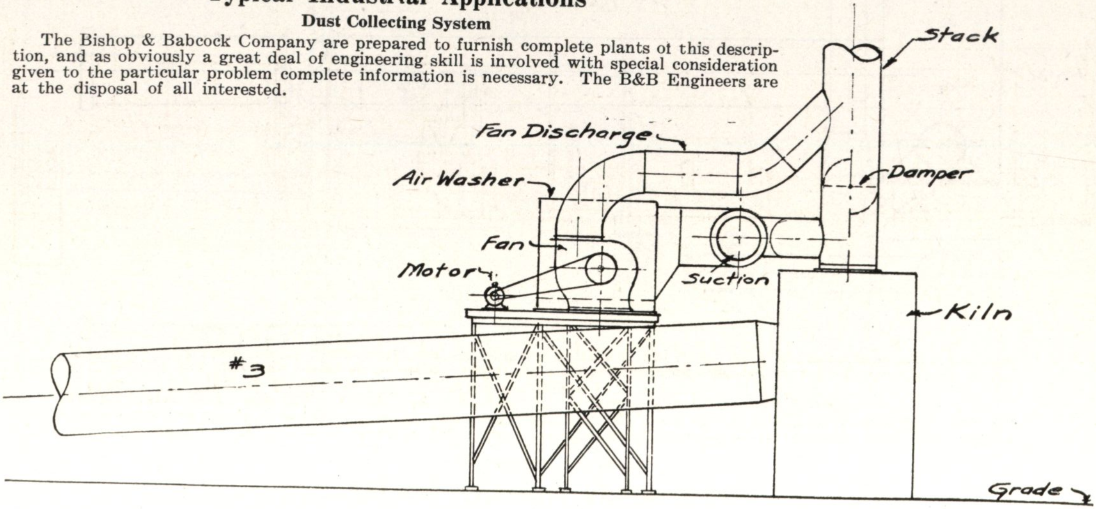
The system illustrated removes dust from chimney gases and which, in this instance, were a public nuisance. A B&B Massachusetts Air Washer and Fan removed the objection. A damper was placed in the stack, and the air washer as illustrated, 95% of the dust being removed.



Typical Industrial Applications

Dust Collecting System

The Bishop & Babcock Company are prepared to furnish complete plants ot this description, and as obviously a great deal of engineering skill is involved with special consideration given to the particular problem complete information is necessary. The B&B Engineers are at the disposal of all interested.



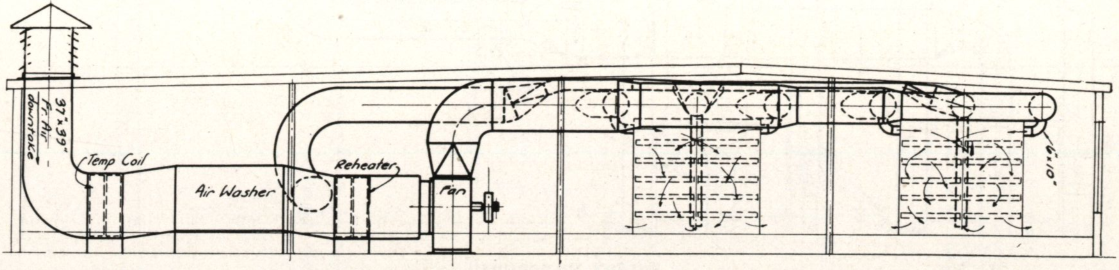
Typical Industrial Applications

Industrial Drying

The illustrations show a drying plant for gum, chicle, or other similar products, the material being dried being a crushed material placed on trays. Air is circulated downward through the trays at the proper temperature, resulting in even drying of the material. No crusting of products, or undue shriveling of the same occurs.

Temperatures ranging from 70 to 200 degrees are obtainable.

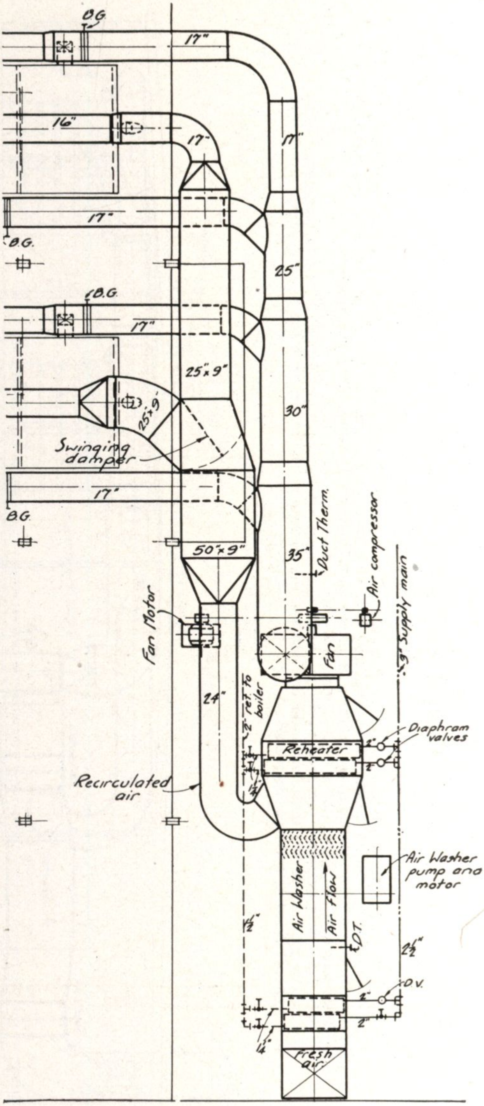
The B&B Engineers are prepared to design, build and erect drying apparatus for all industrial purposes, of the continuous type where wet materials enter one end and dry emerge at the other, or of the room type where material is commonly dried in trays as illustrated.



Elevation.

Typical Industrial Applications

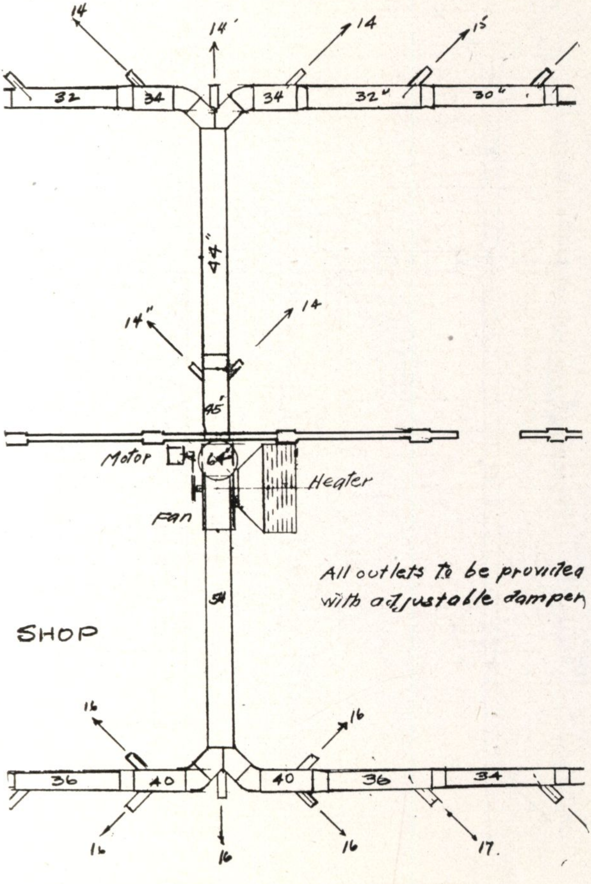
Industrial Drying



Typical Industrial Installations

Shop Heating Plant

The heating of a railroad shop is illustrated on this page. Air is recirculated, the duct system run into the roof construction to be out of the way of craneways. The heated air is carried to the outside walls so that exposed surfaces are taken care of efficiently. In large buildings, where doors are opened frequently, it is not necessary to take in air from the outside for ventilation and recirculation is an economical and effective method of heating and ventilating.

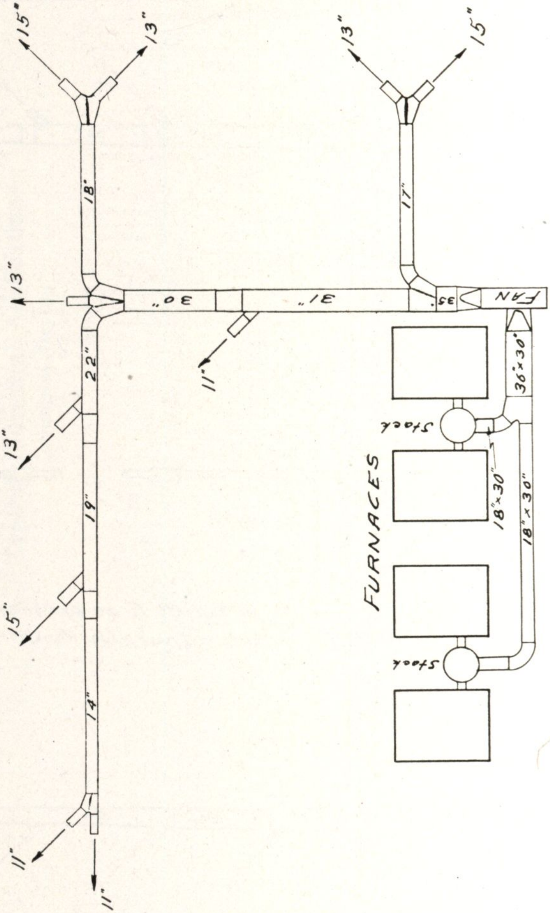


All outlets to be provided with adjustable damper

Typical Industrial Installations

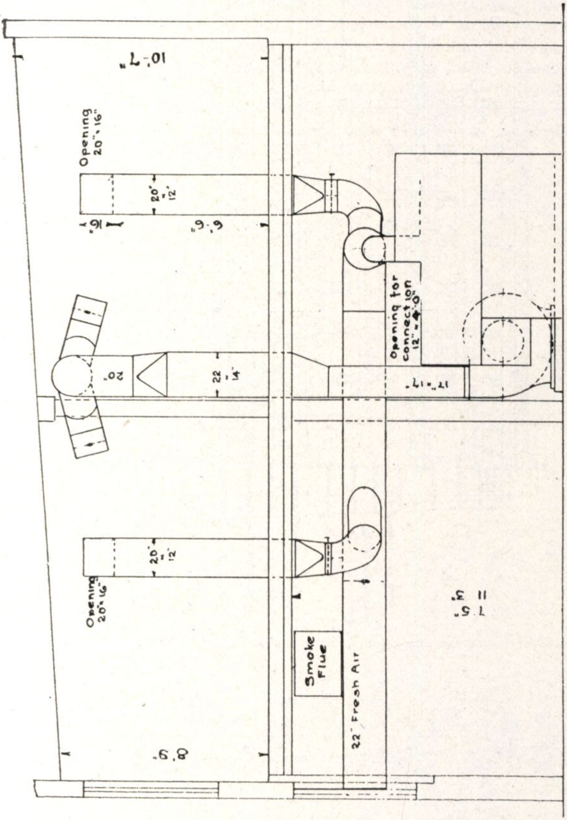
Shop Heating Plant

The illustration on this page shows the heating arrangement as installed in a stamping and enameling shop.



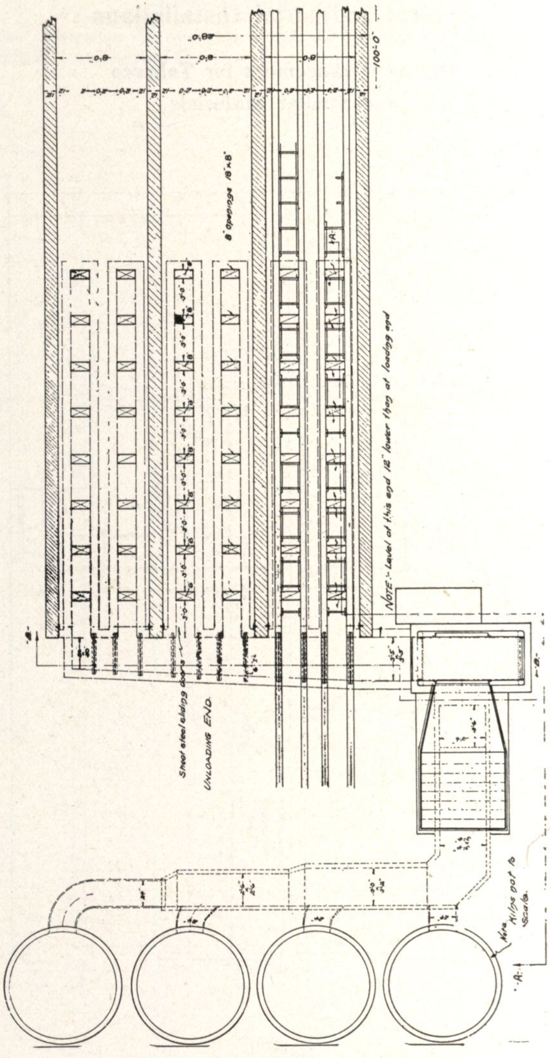
Typical Industrial Installations

Drying Arrangement for Tobacco and Similar Materials



Typical Industrial Applications

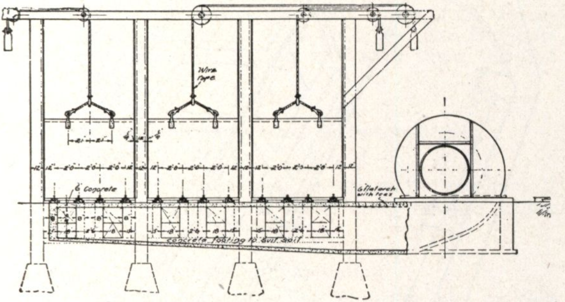
Brick Drying


100'-0"
8' openings 18"x8"
NOTE:- Level at this end 12" lower than at loading end
Sheet steel sliding doors
UNLOADING END.
Note. Kilns not to Scale.
A
B

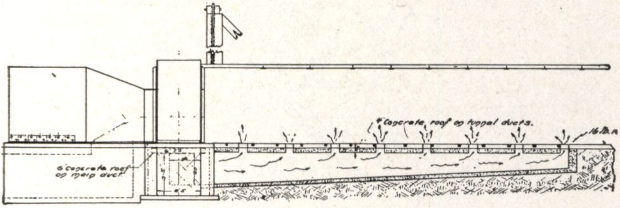
Typical Industrial Installations

Brick Drying

These pages illustrate a method of brick drying arranged for the utilization of waste heat from the kilns. An underground duct is used as illustrated and an auxiliary heating surface is provided for use when there is a lack of waste heat. Dampers permit of the throwing in of this auxiliary heating apparatus, and a desired temperature for drying green brick is under control. The fan forces hot air into a series of ducts terminating in the distributing system, the moist air leaving the kilns through a grating. Positive circulation of air is required for efficient performance. The B&B apparatus of this type have met with marked success and similar apparatus finds use in the drying of many types of ceramic ware.



Section B.B.

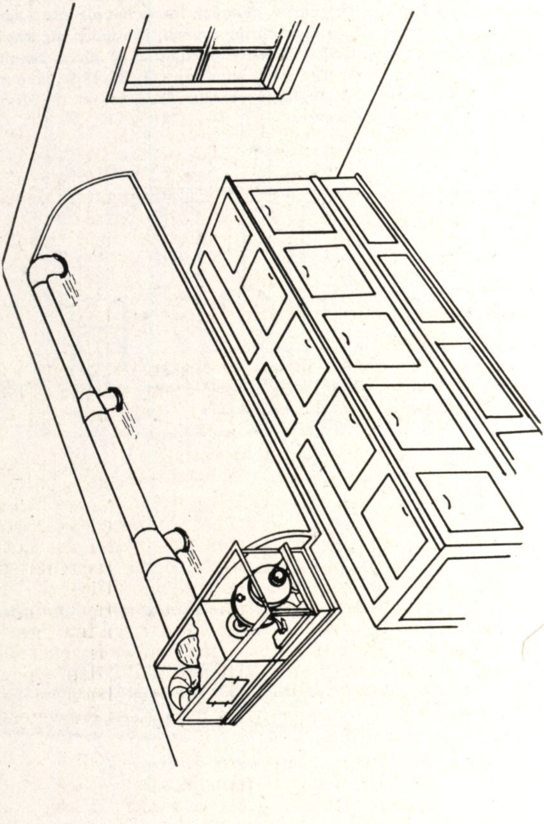

4" Concrete roof on tunnel ducts.
16 lb. R
6" Concrete roof on main duct
Concrete footings to suit soil

Section A-A.

Typical Industrial Applications

Removal of Fumes, Odors, Etc., Over Stoves or Laboratory Apparatus

Davidson Fan Installation



The B&B Line of Massachusetts Air Washers

Cleaning

The cleaning and purifying of the air is secured through the contact, in the spray chamber, of dirt, dust, soot, and bacteria with the fine water spray or mist. The impure particles, clinging to the minute globules of water are carried in air suspension through the spray chamber and impinged against a wetted scrubbing or flooding surface, consisting of vertical galvanized steel plates on one inch centers, having three separate breaks on 30° angle deflections, arranged to provide change in direction of air flow. These scrubbing or flooding plates are covered with a film of water by means of specially designed flooding nozzles, located at the extreme top limit of the washer.

Any particles of water that are carried through the scrubbing surface impinge against banks of dry eliminators having four breaks to provide 30° angle deflections in the air current. These changes in direction, together with the action of hook arrestors, which are a part of all Massachusetts Eliminators, remove all entrained and free particles of moisture from the air and with them the last vestige of dirt.

Cooling

Cooling of air is accomplished by two methods:

1—Evaporation.

2—Cooling of the recirculated water by mechanical means or by supplying cold water from outside source for circulation through the nozzles.

Cooling by Evaporation

Cooling by Evaporation—The entering air striking the bank of mist, created by the nozzles, starts a process of evaporation, requiring heat, which is taken from the air and water, consequently the air and water are both reduced in temperature. The water, being recirculated, will soon approach the wet bulb temperature of the entering air, and the air passing through the spray chamber and scrubbing section will be cooled to within a few dgrees of the water temperature. This cooling effect is generally expressed in percentage of initial wet bulb depression; the wet bulb depression being the difference between the dry bulb and wet bulb temperature in degrees Fahrenheit or Centigrade.

Example:—	Outside dry bulb temperature	90° F
	Outside wet bulb temperature	77° F
	Temperature of water in tank	77° F

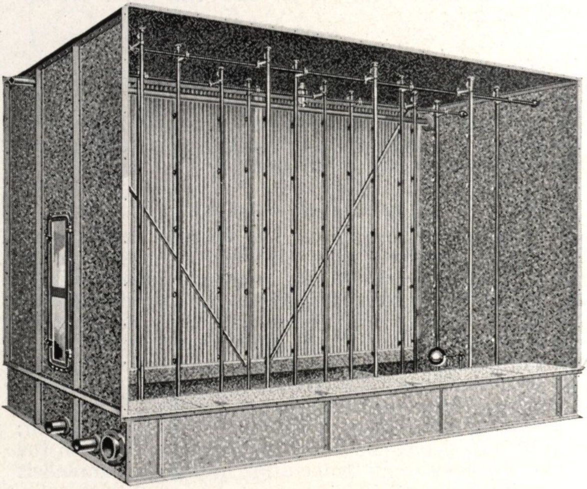
The B&B Line of Massachusetts Air Washers

The ability of Massachusetts Washers to cool in percent of initial wet bulb depression depends upon the type of washer chosen. The Type A Air Washer will cool 85% of this depression. Types B and C will cool 95 to 100% of this depression. Therefore, considering in this example the Type A Washer, the decrease will be 85% of 13° or 11.15° F. The resultant air temperature will be 90° minus 11.15° F or 78.85° F, the washer cooling to within 1.85° F of the temperature of the water.

This decrease in temperature is obtained at an increase in relative humidity. It can be seen that the above cooling effect depends entirely on the condition of the outside air. If the air is dry a greater cooling effect is secured than when the air is damp. At such times as the outside air is almost at the saturation point, little or no cooling effect can be secured by evaporation

Cooling by Mechanical Means

Cooling by Mechanical Means supplements cooling by evaporation. A further cooling of the air is secured by contact with a cold bank of mist or spray, the water being recirculated over some cooling medium and supplied



Massachusetts Air Washer Type B

The B&B Line of Massachusetts Air Washers

constantly to the nozzles at a low temperature. Air can be cooled to almost any degree above freezing desired, depending upon the amount of refrigeration supplied to the water or, in cases of a supply of deep well water, the temperature of the water supply available.

The amount of evaporating effect and the cooling effect depend on the following factors:

1—Relative humidity of entering air.
2—Amount of water sprayed for a given volume of air.
3—Temperature of recirculated water.
4—Fineness of Spray.
5—Length of time treated air is in contact with water, which is governed by the distance between spray banks and eliminators.
6—Velocity of air travel.

Types and Capacities of Massachusetts Air Washers

The Bishop & Babcock line of Massachusetts Air Washers, Coolers and Conditioning Equipment offer, in the following Standard Types, equipment designed to cover all present general uses and each designed for a particular service.

Massachusetts Type "A" Air Washer

This type is an efficient apparatus, designed for all general work in washing, purifying and humidifying as encountered in the average ventilating system and should be used when cooling is a secondary factor to cleansing.

The total length of the Type "A" Washer is seven feet. Intimate contact of air and water is extended over a distance of nearly five feet, insuring a thorough and effcient washing effect, and resulting in the exact humidifying action required.

Washing Effect

The Massachusetts Type "A" Air Washer will remove 98% of all dust, dirt, soot and other free foreign matter from the air.

Cooling Effect

The Massachusetts Type "A" Air Washer will cool the entering air 85% of the initial wet bulb depression. An additional cooling effect may be secured by the use of cold water from outside sources. Also by the use of ice placed in the tank, although the latter method is not recommended as an economical practice.

The B&B Line of Massachusetts Air Washers

Humidifying Effect

Proper control of Humidity can be secured with this washer during the colder weather by means of a Closed or an Ejector Type Heater, operated and regulated by Bishop & Babcock Automatic Humidity Control Apparatus hereinafter described.

Massachusetts Type "B" Air Washer

This type is designed for where as much cooling effect is desired as is possible without the use of Mechanical Refrigeration, and with the aid of agencies such as cold city water, deep well water, etc. It is similar in design to the Type "A" Washer, a second bank of spray nozzles being used and an additional length of Spray Chamber.

The total length of the Type "B" Washer is nine feet. A maximum period of intimate contact of air and water is afforded over a distance of nearly seven feet, thus insuring a very thorough and efficient washing and cleansing effect, a maximum decrease in the temperature of air treated, and in the exact humidifying action required.

Washing Effect

The Massachusetts Type "B" Air Washer will remove 98% of all dust, dirt, soot, and other free foreign matter from the air.

Cooling Effect

The Massachusetts Type "B" Air Washer will cool entering air 95% of the initial wet bulb depression.

Humidifying Effect

Proper control of Humidity can be secured with this washer during the colder weather by means of a Closed or an Ejector Type Heater, operated and regulated by Bishop & Babcock Automatic Humidity Control Apparatus.

Massachusetts Cooling Type Air Washer

This type of washer or Cooler is designed for use in cooling and cleansing air in conjunction with the use of Mechanical Refrigeration only.

The total length of a Standard Massachusetts Cooling Type Air Washer is 13′6″ and is equipped with a tank extending the entire length of washer. The washer is divided into three sections as follows:

The B&B Line of Massachusetts Air Washers

1—Spray Chamber, five feet long, containing two banks of spray nozzles, the suction line to pump, suction strainer, ball float and other accessories.

2—A center section, five feet in length, fitted with a removable side and top cover, and a suitable number of Massachusetts Stuffing boxes for sealing the side cover at points where connections to Baudelot Coils and to rain sprays troughs over coils. The stuffing boxes and side covers are regularly furnished as standard equipment.

This center section is designed to contain the Baudelot Coils, troughs, and pipe connections to same. The five foot length is used on this section to establish a standard. The cooling section can be furnished in any desired length to meet the requirements of a particular installation.

3—A three foot six inch section, containing Scrubbing or Flooding Nozzles, Flooding Plates and two banks of Eliminators.

Washing Effect

The Massachusetts Cooling Type Air Washer will remove 98% of all dust, dirt, soot or other free foreign matter from the air.

Cooling Effect

The amount of Cooling effect obtained, being dependent on Mechanical Refrigeration, is governed by the size of the Refrigerating Unit used. Further information regarding complete cooling units will be furnished on request.

Details of Construction Massachusetts Air Washers

We do not attempt, in this publication, to make any comparison of Massachusetts Air Washers with equipment of competitive make. We confine ourselves to a clear and concise listing of our standards and specifications which are in strict accordance with best modern practice for this class of equipment.

The following details of construction are common with all types of Massachusetts Washers. The various types being designed, each for a particular application rather than for the competitive nature of the applications.

The B&B Line of Massachusetts Air Washers

Tank

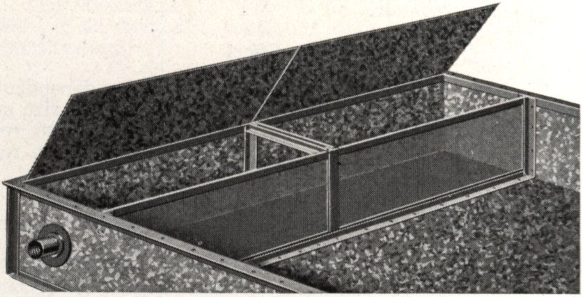
The tank is constructed of No. 13 or No. 11 steel sheets, depending on size, and is firmly braced with a rigid frame of angle iron. The welded construction of the tank eliminates all seams and rivets. The careful and rigid construction of this tank makes it a watertight container for the several thousand pounds of water it is required to hold and an efficient, firm support for the casing and other parts of the washer.

This type of tank construction will meet the most exacting requirements and due to the absence of all seams and rivets reduces corrosion to a minimum.

Tanks of unusually large size will be furnished with seams to be welded in the field.

Suction Strainer

The strainer is located in the end of settling tank, dividing the tank into two compartments as all recirculated water to pump must pass through this strainer. An effective means of filtering this water is afforded, eliminating any possibility of clogging in the nozzles.



Suction Strainer

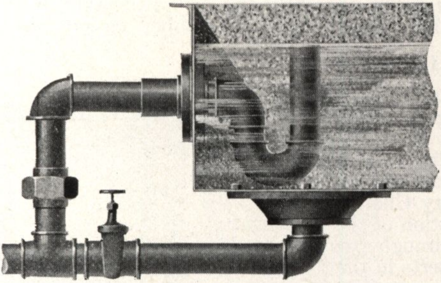
The strainer is made of No. 14 Mesh Brass Gauze, fitted in a rigid frame. The strainer is equipped with handles for easy removal and cleaning.

The strainer box is fitted with a No. 14 Gauge hinged galvanized steel cover to allow ready access to strainer.

The B&B Line of Massachusetts Air Washers

Drain and Overflow

A two inch overflow and a two inch valved drain is supplied with all standard washers. The drain and overflow have no standard location and are generally placed in the bottom of the tank at a point most convenient to the sewer line.



Where a large amount of water is constantly wasted in cooling, a larger overflow and drain are furnished.

Screw flanges are placed on each side of metal of the tank, and drawn together on rubber gaskets.

The overflow is furnished with a Goose Neck Water Seal Trap, which completely eliminates any possibility of the fan sucking odors and sewer gases into the spray chamber.

Fresh Water Supply

A valve actuated by a ball float is installed in the tank as standard equipment to automatically maintain the proper water level in tank. This valve is connected to fresh water supply.

A ¾″ fresh water connection is also furnished, fitted with valve and hose connection, to be used when cleaning the washer and when refilling tank after cleaning.

Suction and Supply Connections

The connections made through the side of the tank for pump suction and discharge to supply headers vary in size to meet capacity of the washer. Supply connections are individually valved.

The B&B Line of Massachusetts Air Washers

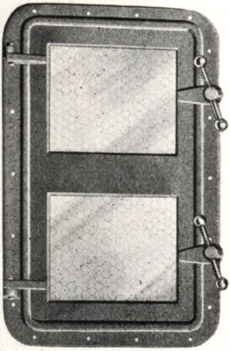
Casing

The casing is made of No. 18 Galvanized Steel, thoroughly braced with galvanized angles, on centers not exceeding three feet. All seams and rivet heads are soldered to insure water tight construction. The top and sides are made separately and bolted together in the field, using Sherardized bolts and rubber gasket joints.

Inspection Door

The casing is provided with a heavy galvanized cast iron inspection door, held tight with cam locks and rubber gaskets. This door permits free access to the Spray Chamber and a view of operation of the washer at all times through two heavy plate glass inserts in the door.

Washers less than four feet in height are furnished with a bull's eye window in place of an inspection door.



Spray Headers

All spray headers are of extra heavy galvanized iron pipe, rigidly supported in tank to hold risers to mist nozzles in a fixed position. The vertical risers, in which the nozzles are placed, are tilted to prevent drip and condensation from breaking up the spray in lower spray chamber. These vertical risers are held rigidly in place by a cross support at top of the washer.

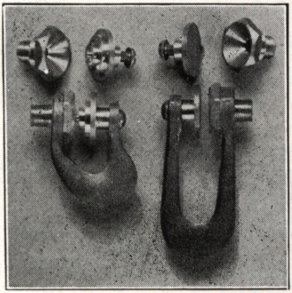
All spray headers are separately valved outside of the washer to allow a flexibility of washer control. During the season when excessive humidities are encountered and no cooling effect can be obtained, the spray banks may be shut off entirely and a suitable cleansing of air effected by the use of the Flooding Nozzles and plates alone, this without any appreciable increase in relative humidity.

The B&B Line of Massachusetts Air Washers

Spray Nozzles

The Spray heads or nozzles are of the non-cloggable, self-cleaning type, and eliminate the necessity of a flushing mechanism. The spray type of nozzle creates a finely divided mist with water at 15 pounds pressure, each nozzle having a capacity of two gallons of water per minute.

In the Type A Washer, one nozzle is provided for each square foot of sectional free area.



In the Type B & C Washers, two nozzles are provided for each square foot of sectional free area.

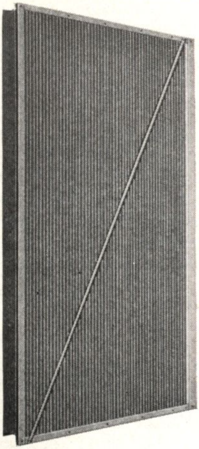
Flooding Nozzles

The Flooding Nozzles, like the spray nozzles, are of the non-cloggable, self-cleaning type, and create a flat sheet of water, turning into a rain-like spray at the edges, insuring a uniform film of water covering the flooding or scrubbing surfaces at all times.

In cases where washers are of an extreme height, an additional row of flooding nozzles is placed half way down the plates to insure uniformity in the water film, and in cleansing effect.

Marine Light

All Massachusetts Washers are provided with a waterproof marine lighting fixture which accommodates any standard electric light bulb. This makes a convenient and easy inspection of interior of the washer possible.



Flooding or Scrubbing Surfaces

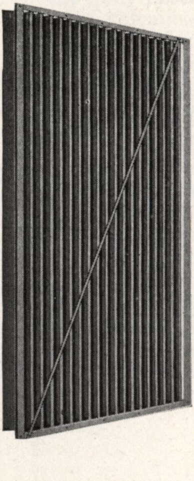
For the removal of dust, soot, and other foreign matter, which might pass the spray chamber, Flooding or Scrubbing surfaces are used, consisting of a row of vertical baffles, constructed of No. 20 to 22 gauge galvanized steel, according to size, spaced on one inch centers, arranged with three separate breaks on 30° angle deflections, and providing three changes in direction of air flow, resulting in an efficient cleansing process.

At 500 foot velocity 40 square feet of washing or scrubbing surface is furnished per 1000 CFM handled by the washer.

These Flooding Plates are assembled in sections, in rigid frames. One man can easily assemble the scrubber bank or any section can be readily removed for cleaning or repair.

Eliminators

The Massachusetts Air Washer Eliminators remove the entrained water from the moistened or conditioned air, and consist of a series of vertical baffles, constructed of No. 20 to 22 Gauge galvanized steel, according to size, spaced 3″ on centers, and arranged with four breaks on 30° angle deflections, each break built with a hook arrester providing four changes in direction of airflow, their arrangement offering a minimum resistance to the passage of air and at the same time effectively removing all entrained water.



The resistance to the passage of air at an ordinary velocity of 500 feet per minute is under .17 inch water gauge.

The eliminators are constructed in sections or banks of convenient size for handling, and are shipped assembled, being held in position when installed in the washer by a rigid frame of galvanized angle iron. They are supported on a pedestal extending to the bottom of the air washer tank.

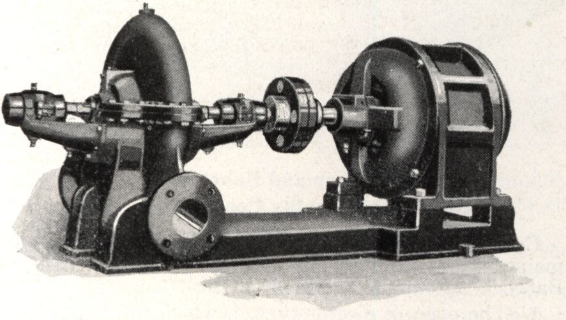
The B&B Line of Massachusetts Air Washers

A complete bank of eliminators can be removed from the washer quickly and easily. A baffle plate is placed at the bottom of the front row of eliminators to prevent air by-passing under the eliminator bank.

At a velocity of 500 feet per minute, the washer presents an eliminating surface of 32 square feet per 1000 CFM handled by the washer.

Pump and Motor

Double suction centrifugal type pumps with enclosed impellers are standard equipment for all sizes and types of Massachusetts Washers. The casing is split horizontally to allow easy inspection without disturbing water connections.



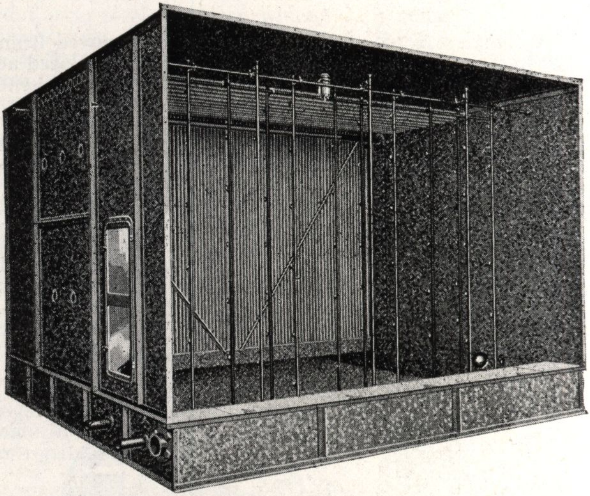
Pumps furnished with standard washers are driven by direct connected motors, motor and pump being mounted on a common cast iron base.

Pumps driven by a belt, steam turbine, or other means can be furnished when required.

Pressure Gauge

A five inch diameter nickeled pressure gauge is furnished with all washers. This gauge is connected up to indicate the pressure at which the water is being supplied to the nozzles.

The B&B Line of Massachusetts Air Washers



Massachusetts Cooling Type Air Washer

Bishop and Babcock
Automatic Humidity Control Apparatus

Control of humidity can be positively and accurately maintained by means of either of the two types of Bishop & Babcock automatic humidity control.

1—The open or ejector type in which the temperature of water is raised by steam passing directly into the spray water at the suction of circulating pump. This system should not be used unless a steam pressure of at least three pounds is at all times available.

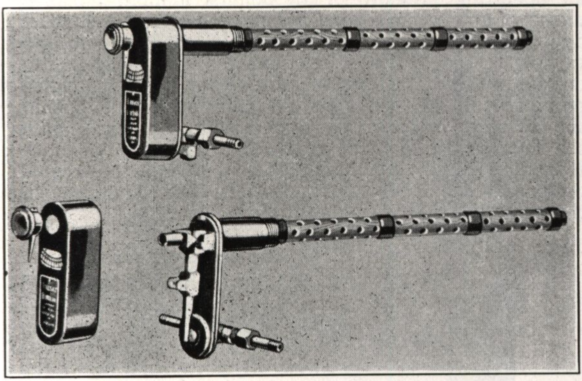
2—The Closed Heater Type in which a portion of the water is by-passed through a closed water heater of standard manufacture, the water being heated by a hot water or steam supply.

An Illustration showing the general arrangement of a Massachusetts Heating Ventilating and Air Conditioning System is given on Pages 186 and 187. This illustration also shows all temperature and humidity control equipment, together with pipe connection to same. On Page 188 will be found a complete description of this illustration and an explanation of the operation of the various apparatus.

The B&B Line of Massachusetts Air Washers

Bishop & Babcock Duct Hygrostat

The Bishop & Babcock Hygrostat is an insertion, or extended tube, pneumatic type instrument for controlling humidity. The operation depends on expansion or contraction of a number of sensitive wooden cylinders of cross grained maple, set in series, multiplying this effect.

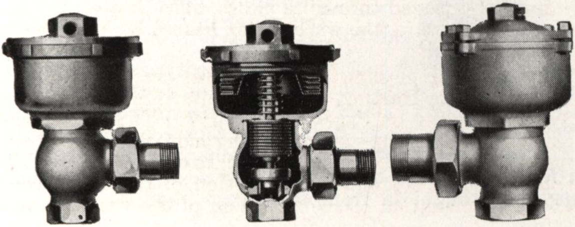


The expansion of this element, when the humidity rises, moves the lever arm which operates the main air valve.

The valve in the Bishop & Babcock Hygrostat is the same type of valve which is used in Bishop & Babcock Thermostats, and contains no restricted openings, and is very easily connected up for the purpose for which it is used.

Bishop & Babcock Multiflex Pneumatic Valves

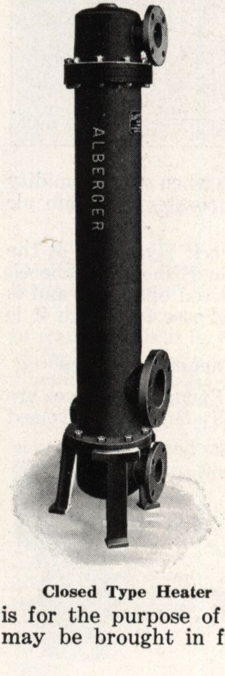
The Bishop & Babcock Multiflex Pneumatic Valves are furnished in two types, viz: Normally Open, or Reversed



The B&B Line of Massachusetts Air Washers

Valves which are normally closed. Their action is governed by the hygrostat or thermostat to which they may be connected, giving an automatic humidity control of highest quality and greatest serviceability.

The Bishop & Babcock Multiflex Pneumatic Valves are connected to the Hygrostat by ⅛″ air piping in which an operating pressure of 15 pounds is maintained by means of an air compressor. When the Hygrostat expands, due to humidity increase, the air is automatically allowed to flow to the Multiflex pneumatic valve, which, acting on the multiflex bellows therein, closes the valve tightly on its seat in the case of the normally open type, opening the Reversed or Normally Closed type; conversely, when the Hygrostatic element contracts, the air valve in the Hygrostat closes, exhausting the air, relieving the air pressure on the Multiflex pneumatic valve and causing the valve to revert to its normal position.



Closed Type Heater

Closed Type Heater

Standard single pass vertical or horizontal heaters are used. Shell, tube heads, covers, supports and baffles are constructed of close grain grey iron. Tubes are of seamless drawn copper, corrugated ¾″ O D. The heater is so constructed that heating surface is entirely accessible. The heater is given hydraulic tests of 50 pounds on steam spaces, and 150 pounds on water spaces.

Ejector or Open Type Heater

This is a combination noiseless heater and mixing chamber constructed of cast iron for intimately mixing the steam and water in the pump suction connection.

When this type of heater is used a Bishop & Babcock Dirt Strainer is furnished to be installed in pipe connection from pump discharge. This strainer is for the purpose of catching any scale or dirt, which may be brought in from the steam lines.

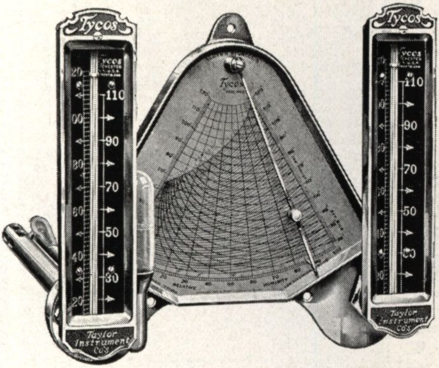
The B&B Line of Massachusetts Air Washers

Air Compressor and Tank

In cases where a supply of compressed air, from house supply or temperature control system, is not available, a motor or belt driven air cooled air compressor is furnished, together with tank, air regulating valve; with motor driven compressor, electric switch and pressure controlling device.

Angle Hygrodeiks

The Hygrodeik consists of an angle wet bulb and dry bulb thermometer, together with a chart from which the humidity conditions can be determined without reference to tables. The instrument is of the insertion type and for measuring humidity in air ducts. There is a water reservoir of ample capacity extending parallel to stem of one angle thermometer, together with a water level indicator.

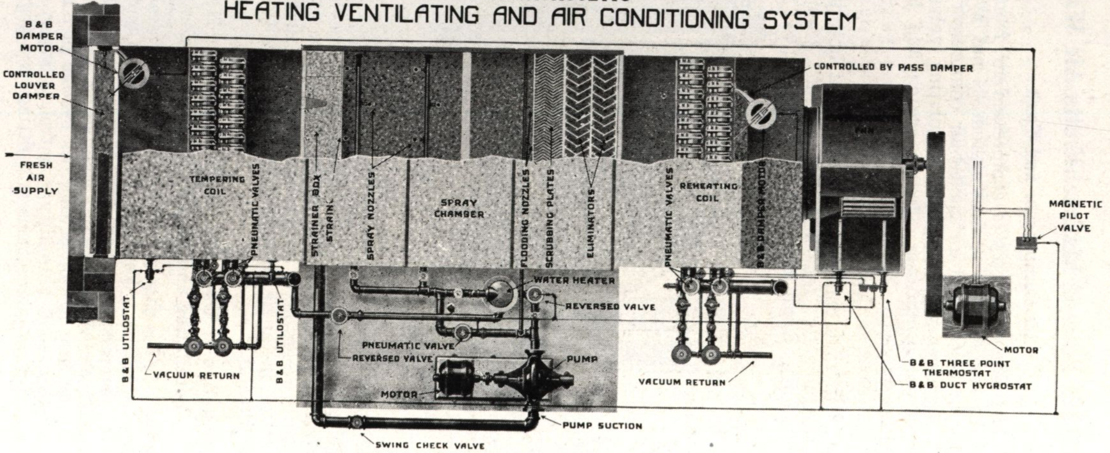


No. 1313

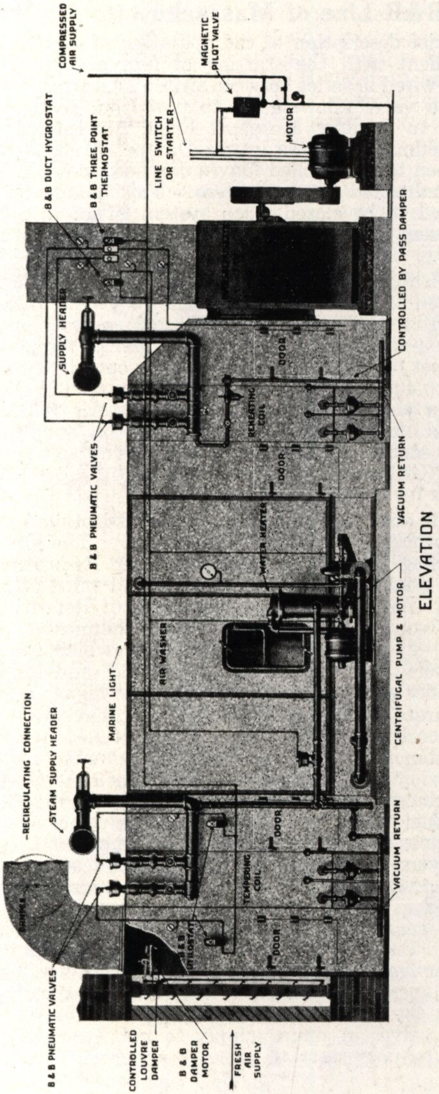
Explanation of Operation of Massachusetts Heating, Ventilating and Air Conditioning System

On page 187 is shown an illustration of a typical Massachusetts Heating, Ventilating and Air Conditioning System, comprising a Fan and Motor, Reheating Coil, Massachusetts Air Washer, Tempering Coil, together with a complete Bishop & Babcock system of Automatic Temperature and Humidity Control. Steam Supply, Vacuum Return connections and fittings are also shown.

TYPICAL ARRANGEMENT
MASSACHUSETTS
HEATING VENTILATING AND AIR CONDITIONING SYSTEM



SECTIONAL PLAN


COMPRESSED AIR SUPPLY
MAGNETIC PILOT VALVE
B & B DUCT HYGROSTAT
B & B THREE POINT THERMOSTAT
LINE SWITCH OR STARTER
MOTOR
SUPPLY HEADER
CONTROLLED BY PASS DAMPER
DOOR
REHEATING COIL
DOOR
B & B PNEUMATIC VALVES
VACUUM RETURN
WATER HEATER
CENTRIFUGAL PUMP & MOTOR
AIR WASHER
MARINE LIGHT
RECIRCULATING CONNECTION
STEAM SUPPLY HEADER
DOOR
TEMPERING COIL
VACUUM RETURN
DAMPER
B & B UTILOSTAT
DOOR
B & B PNEUMATIC VALVES
CONTROLLED LOUVRE DAMPER
B & B DAMPER MOTOR
FRESH AIR SUPPLY

ELEVATION

The B&B Line of Massachusetts Air Washers

A brief description of the operation of system follows: Coincident with the starting of fan, a Magnetic Pilot Valve, wired in series between switch or starter and motor, opens a valve allowing air to flow from compressed air supply to Damper Motor at Fresh Air Intake, causing the pneumatic bellows in the Damper Motor to expand and open the controlled louvre damper, allowing fresh air to be admitted to the system. This damper is always arranged to be closed when system is not in operation, to prevent any possibility of freezing in the heaters or washer.

A Bishop & Babcock Utilostat or Duct Thermostat is placed in the casing between Fresh Air Intake and Tempering Coils. This Thermostat controls pneumatic valve on steam supply to first section of tempering coil and is set to open the valve when the outside temperature drops to 40° F. A second Utilostat is placed in the casing between the Tempering Coil and the Air Washer, and controls the pneumatic valve on steam supply to the second section of Tempering Coil. The setting of this second Utilostat is arbitrary, depending upon the class of work for which the system is used.

In the discharge duct from the fan is installed a Bishop & Babcock Three-point Thermostat. The first point controlling the by-pass damper under Re-heating Coils with a graduate action, the second and third points controlling the first and second sections of Reheating Coils respectively. The setting of this thermostat depends entirely upon the class of service for which the system is intended; for ventilating systems 68° and for heating and other purposes a correspondingly higher setting.

Accurate control of humidity is obtained by a Bishop & Babcock Duct Type Hygrostat installed in discharge duct from fan. This instrument is actuated by the expansion or contraction of a cross grained maple element, due to increase or decrease in the moisture content of the air. When the element contracts, the valve opens, allowing air to flow from the compressed air supply and operating two reversed and one normally open Pneumatic Valves.

The reversed or normally closed Pneumatic valves are installed in the steam supply to hot water heater and in the by-pass connection from pump through hot water heater. The normally open Pneumatic valve is installed in water connection from pump to spray header. The three valves operate in unison. When the relative humidity reaches the point at which the Hygrostat is set, the reversed valves in steam supply to hot water heater and heater by-pass start to close; the normally open valve in connection between the pump and spray header opens allowing all of the recirculated water to by-pass the hot water heater. Conversely, when the relative humidity drops below the point at which the Hygrostat is set, the reversed valves open and the normally open valve partially closes, by-passing the required portion of the recirculated water through the hot water heater, and the required humidifying effect is obtained.

Applications of Massachusetts Air Washers

Owing to the unique and special nature of each air washing and conditioning problem, and the multitude of uses encountered, it is impossible for us to give, in this catalogue, more than general information as to the various uses to which the air washers are applied.

The following listing and brief discussions represent only a few of the many uses of Air Washing and Conditioning Equipment.

Department Stores

The need of clean pure air in the Department Store is best expressed in the age old word "Shop-worn." The saving effected by reducing the losses, due to dust soiled goods, will pay for the air washing equipment many times over.

Telephone Exchanges

Since the advent of the Automatic Telephone, air washing and cleansing equipment have become indispensable to the successful operation of the modern telephone exchange.

Museum and Art Galleries

The maintaining of an atmosphere free from dust and dirt, and at a constant temperature and humidity, reduces to a minimum the decomposition and disintegration of the relics and priceless objects of art.

Lithographing Plants

Change of register in lithographing is eliminated by maintaining a constant temperature and relative humidity in the press room. However, it is of importance that raw stock be supplied at a moisture content which is normal for the atmosphere which is maintained in the press room.

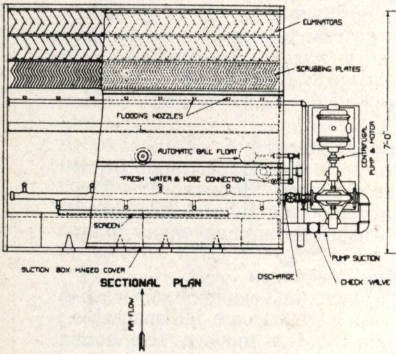
Paper and Pulp Mills

Air conditioning systems, in the Finishing Rooms, insure a uniform moisture content in the finished product.

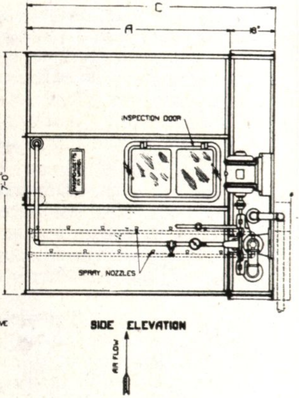
Clean air is essential in the manufacture of bleached pulp and white papers.

Additional applications are found in: Chemical Laboratories, Cooling Condenser Water, Solvent Recovery Systems, Cooling Engine Rooms, Pickling Rooms of Wire and Steel Plants, Drying Installations, Elimination of Dust in Manufacturing Processes, Sugar Refineries, Foundry Ventilation and Cooling.

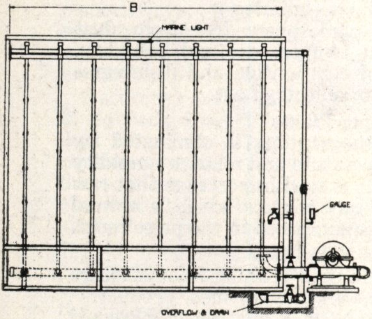
The B&B Line of Massachusetts Air Washers



SECTIONAL PLAN



SIDE ELEVATION



FRONT ELEVATION

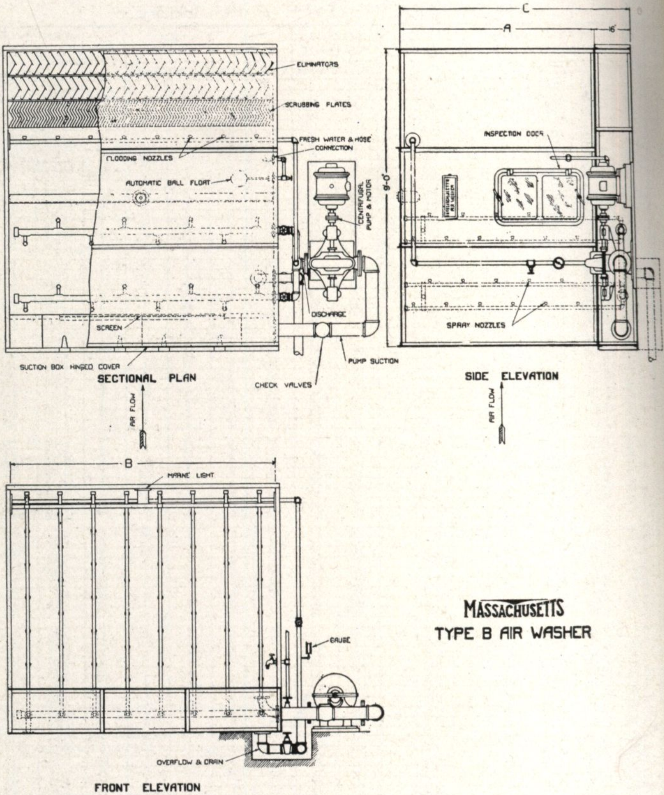
MASSACHUSETTS
TYPE A AIR WASHER

The B&B Line of Massachusetts Air Washers

DATA AND DIMENSIONS
MASSACHUSETTS TYPE A AIR WASHER

NO. OF WASHER	CAPACITY CUBIC FEET PER. MIN		FREE AREA SQ. FT.	A	B	C	GALLONS PER MINUTE		NO NOZZLES		SIZE PUMP		H.P. MOTOR	WEIGHT IN LBS.	
	400' VEL	500' VEL					SPRAY	FLOODING	SPRAY	FLOODING	SUCTION	DISCHARGE		WASHER	PUMP & MOTOR
A-22	1600	2000	4	2'-0"	2'-0"	3'-4"	10	8	4	2	1½	1	1	890	425
A-23	2400	3000	6	-	3'-0"	-	15	12	6	3	1½	1	1½	1150	500
A-24	3200	4000	8	-	4'-0"	-	20	16	8	4	1½	1	1½	1325	500
A-25	4000	5000	10	-	5'-0"	-	25	20	10	5	2	1½	3	1510	525
A-33	3600	4500	9	3'-0"	3'-0"	4'-4"	23	12	9	3	1½	1	1½	1300	500
A-34	4800	6000	12	-	4'-0"	-	30	16	12	4	2	1½	3	1510	525
A-35	6000	7500	15	-	5'-0"	-	38	20	15	5	2	1½	3	1750	525
A-36	7200	9000	18	-	6'-0"	-	45	24	18	6	2	1½	3	1980	525
A-37	8400	10500	21	-	7'-0"	-	53	28	21	7	2	1½	3	2200	525
A-43	4800	6000	12	4'-0"	3'-0"	5'-4"	30	12	12	3	2	1½	2	1550	500
A-44	6400	8000	16	-	4'-0"	-	40	16	16	4	2	1½	3	1800	525
A-45	8000	10000	20	-	5'-0"	-	50	20	20	5	2	1½	3	2030	525
A-46	9600	12000	24	-	6'-0"	-	60	24	24	6	2	1½	3	2350	525
A-47	11200	14000	28	-	7'-0"	-	70	28	28	7	2½	2	3	2575	550
A-48	12800	16000	32	-	8'-0"	-	80	32	32	8	2½	2	3	2850	550
A-53	6000	7500	15	5'-0"	3'-0"	6'-4"	38	12	15	3	2	1½	3	1700	525
A-54	8000	10000	20	-	4'-0"	-	50	16	20	4	2	1½	3	1975	525
A-55	10000	12500	25	-	5'-0"	-	63	20	25	5	2	1½	3	2260	525
A-56	12000	15000	30	-	6'-0"	-	75	24	30	6	2½	2	3	2775	550
A-57	14000	17500	35	-	7'-0"	-	88	28	35	7	2½	2	3	3050	550
A-58	16000	20000	40	-	8'-0"	-	100	32	40	8	2½	2	5	3375	615
A-59	18000	22500	45	-	9'-0"	-	113	36	45	9	3	2½	5	3650	640
A-64	9600	12000	24	6'-0"	4'-0"	7'-4"	60	16	24	4	2	1½	3	2250	525
A-65	12000	15000	30	-	5'-0"	-	75	20	30	5	2½	2	3	2575	550
A-66	14400	18000	36	-	6'-0"	-	90	24	36	6	2½	2	3	3150	550
A-67	16800	21000	42	-	7'-0"	-	105	28	42	7	2½	2	5	3475	615
A-68	19200	24000	48	-	8'-0"	-	120	32	48	8	3	2½	5	3850	640
A-69	21600	27000	54	-	9'-0"	-	135	36	54	9	3	2½	5	4150	640
A-610	24000	30000	60	-	10'-0"	-	150	40	60	10	3	2½	5	4475	640
A-611	26200	33000	66	-	11'-0"	-	165	44	66	11	4	3	5	4800	675
A-612	28800	36000	72	-	12'-0"	-	180	48	72	12	4	3	5	5125	675
A-75	14000	17500	35	7'-0"	5'-0"	8'-4"	88	20	35	5	2½	2	3	2800	550
A-76	16800	21000	42	-	6'-0"	-	105	24	42	6	2½	2	5	3450	615
A-77	19600	24500	49	-	7'-0"	-	123	28	49	7	3	2½	5	4000	640
A-78	22400	28000	56	-	8'-0"	-	140	32	56	8	3	2½	5	4400	640
A-79	25200	31500	63	-	9'-0"	-	158	36	63	9	3	2½	5	4775	640
A-710	28000	35000	70	-	10'-0"	-	175	40	70	10	4	3	5	5175	675
A-711	31800	38500	77	-	11'-0"	-	193	44	77	11	4	3	5	5550	675
A-712	33600	42000	84	-	12'-0"	-	210	48	84	12	4	3	7½	6100	725
A-86	19200	24000	48	8'-0"	6'-0"	9'-4"	120	24	48	6	3	2½	5	3825	640
A-87	22400	28000	56	-	7'-0"	-	140	28	56	7	3	2½	5	4350	640
A-88	25600	32000	64	-	8'-0"	-	160	32	64	8	3	2½	5	4850	640
A-89	28800	36000	72	-	9'-0"	-	180	36	72	9	4	3	5	5250	675
A-810	32000	40000	80	-	10'-0"	-	200	40	80	10	4	3	5	5650	675
A-811	35200	44000	88	-	11'-0"	-	220	44	88	11	4	3	7½	6075	725
A-812	38400	48000	96	-	12'-0"	-	240	48	96	12	4	3	7½	6725	725
A-813	41600	52000	104	-	13'-0"	-	260	52	104	13	4	3	7½	7125	725
A-814	44800	56000	112	-	14'-0"	-	280	56	112	14	4	3	7½	7575	725
A-97	25200	31500	63	9'-0"	7'-0"	10'-4"	158	28	63	7	3	2½	5	4690	640
A-98	28800	36000	72	-	8'-0"	-	180	32	72	8	3	2½	5	5200	640
A-99	32400	40500	81	-	9'-0"	-	204	36	81	9	4	3	5	5675	575
A-910	36000	45000	90	-	10'-0"	-	225	40	90	10	4	3	7½	6100	725
A-911	39600	49500	99	-	11'-0"	-	247	44	99	11	4	3	7½	6550	725
A-912	43200	54000	108	-	12'-0"	-	270	48	108	12	4	3	7½	7350	725
A-913	46800	58500	117	-	13'-0"	-	293	52	117	13	4	3	7½	7800	725
A-914	50400	63000	126	-	14'-0"	-	315	56	126	14	5	4	7½	8250	925
A-915	54000	67500	135	-	15'-0"	-	338	60	135	15	5	4	10	8775	1000
A-916	57600	72000	144	-	16'-0"	-	360	64	144	16	5	4	10	9200	1000
A-107	28000	35000	70	10'-0"	7'-0"	11'-4"	175	28	70	7	3	2½	5	4825	640
A-108	32000	40000	80	-	8'-0"	-	200	32	80	8	4	3	5	5550	675
A-109	36000	45000	90	-	9'-0"	-	225	36	90	9	4	3	7½	6025	725
A-1010	40000	50000	100	-	10'-0"	-	250	40	100	10	4	3	7½	6500	725
A-1011	44000	55000	110	-	11'-0"	-	275	44	110	11	4	3	7½	6975	725
A-1012	48000	60000	120	-	12'-0"	-	300	48	120	12	5	4	7½	7780	925
A-1013	52000	65000	130	-	13'-0"	-	325	52	130	13	5	4	7½	8325	925
A-1014	56000	70000	140	-	14'-0"	-	350	56	140	14	5	4	10	8850	1000
A-1015	60000	75000	150	-	15'-0"	-	375	60	150	15	5	4	10	9350	1000
A-1016	64000	80000	160	-	16'-0"	-	400	64	160	16	5	4	10	9800	1000
A-1017	68000	85000	170	-	17'-0"	-	425	68	170	17	5	4	10	10550	1000
A-1018	72000	90000	180	-	18'-0"	-	450	72	180	18	5	4	15	11100	1200
A-1019	76000	95000	190	-	19'-0"	-	475	76	190	19	5	4	15	11600	1200
A-1020	80000	100000	200	-	20'-0"	-	500	80	200	20	5	4	15	12100	1200

The B&B Line of Massachusetts Air Washers



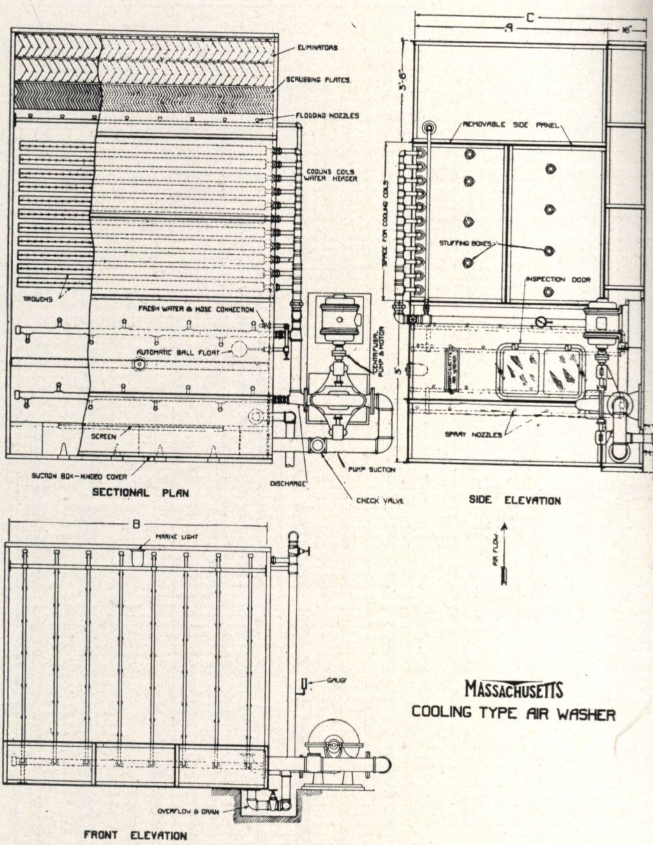
MASSACHUSETTS
TYPE B AIR WASHER

The B&B Line of Massachusetts Air Washers

DATA AND DIMENSIONS
MASSACHUSETTS TYPE B AIR WASHER

NO. OF WASHER	CAPACITY CUBIC FEET PER MIN		FREE AREA SQ. FT.	A	B	C	GALLONS PER. MINUTE		NO. NOZZLES		SIZE PUMP		H.P MOTOR	WEIGHT IN LBS.	
	400' VEL.	500' VEL.					SPRAY	FLOODING	SPRAY	FLOODING	SUCTION	DISCHARGE		WASHER	PUMP & MOTOR
B-22	1600	2000	4	2'-0"	2'-0"	3'-4"	20	8	8	2	1½	1	1½	1025	500
B-23	2400	3000	6	"	3'-0"	"	30	12	12	3	2	1½	2	1275	500
B-24	3200	4000	8	"	4'-0"	"	40	16	16	4	2	1½	3	1500	525
B-25	4000	5000	10	"	5'-0"	"	50	20	20	5	2	1½	3	1725	525
B-33	3600	4500	9	3'-0"	3'-0"	4'-4"	45	12	18	3	2	1½	3	1450	525
B-34	4800	6000	12	"	4'-0"	"	60	16	24	4	2	1½	3	1700	525
B-35	6000	7500	15	"	5'-0"	"	75	20	30	5	2½	2	3	1950	550
B-36	7200	9000	18	"	6'-0"	"	90	24	36	6	2½	2	3	2225	550
B-37	8400	10500	21	"	7'-0"	"	105	28	42	7	2½	2	5	2475	615
B-43	4800	6000	12	4'-0"	3'-0"	5'-4"	60	12	24	3	2	1½	3	1700	525
B-44	6400	8000	16	"	4'-0"	"	80	16	32	4	2½	2	3	2000	550
B-45	8000	10000	20	"	5'-0"	"	100	20	40	5	2½	2	3	2275	550
B-46	9600	12000	24	"	6'-0"	"	120	24	48	6	3	2½	5	2600	640
B-47	11200	14000	28	"	7'-0"	"	140	28	56	7	3	2½	5	2875	640
B-48	12800	16000	32	"	8'-0"	"	160	32	64	8	3	2½	5	3150	640
B-53	6000	7500	15	5'-0"	3'-0"	6'-4"	75	12	30	3	2	1½	3	1900	525
B-54	8000	10000	20	"	4'-0"	"	100	16	40	4	2½	2	3	2200	550
B-55	10000	12500	25	"	5'-0"	"	125	20	50	5	3	2½	5	2525	640
B-56	12000	15000	30	"	6'-0"	"	150	24	60	6	3	2½	5	3050	640
B-57	14000	17500	35	"	7'-0"	"	175	28	70	7	3	2½	5	3350	640
B-58	16000	20000	40	"	8'-0"	"	200	32	80	8	4	3	5	3750	675
B-59	18000	22500	45	"	9'-0"	"	225	36	90	9	4	3	7½	4050	725
B-64	9600	12000	24	6'-0"	4'-0"	7'-4"	120	16	48	4	2½	2	5	2500	615
B-65	12000	15000	30	"	5'-0"	"	150	20	60	5	3	2½	5	2875	640
B-66	14400	18000	36	"	6'-0"	"	180	24	72	6	3	2½	5	3475	640
B-67	16800	21000	42	"	7'-0"	"	210	28	84	7	4	3	5	3850	675
B-68	19200	24000	48	"	8'-0"	"	240	32	96	8	4	3	7½	4250	725
B-69	21600	27000	54	"	9'-0"	"	270	36	108	9	4	3	7½	4600	725
B-610	24000	30000	60	"	10'-0"	"	300	40	120	10	4	3	7½	4950	725
B-611	26200	33000	66	"	11'-0"	"	330	44	132	11	5	4	7½	5350	925
B-612	28800	36000	72	"	12'-0"	"	360	48	144	12	5	4	10	5700	1000
B-75	14000	17500	35	7'-0"	5'-0"	8'-4"	175	20	70	5	3	2½	5	3100	640
B-76	16800	21000	42	"	6'-0"	"	210	24	84	6	4	3	5	3800	675
B-77	19600	24500	49	"	7'-0"	"	245	28	98	7	4	3	7½	4400	725
B-78	22400	28000	56	"	8'-0"	"	280	32	112	8	4	3	7½	4850	725
B-79	25200	31500	63	"	9'-0"	"	315	36	126	9	4	3	7½	5250	725
B-710	28000	35000	70	"	10'-0"	"	350	40	140	10	5	4	7½	5725	925
B-711	31800	38500	77	"	11'-0"	"	385	44	154	11	5	4	10	6125	1000
B-712	33600	42000	84	"	12'-0"	"	420	48	168	12	5	4	10	6725	1000
B-86	19200	24000	48	8'-0"	6'-0"	9'-4"	240	24	96	6	4	3	7½	4200	725
B-87	22400	28000	56	"	7'-0"	"	280	28	112	7	4	3	7½	4800	725
B-88	25600	32000	64	"	8'-0"	"	320	32	128	8	4	3	7½	5300	725
B-89	28800	36000	72	"	9'-0"	"	360	36	144	9	5	4	7½	5800	925
B-810	32000	40000	80	"	10'-0"	"	400	40	160	10	5	4	10	6225	1000
B-811	35200	44000	88	"	11'-0"	"	440	44	176	11	5	4	10	6700	1000
B-812	38400	48000	96	"	12'-0"	"	480	48	192	12	5	4	15	7375	1200
B-813	41600	52000	104	"	13'-0"	"	520	52	208	13	5	4	15	7800	1200
B-814	44800	56000	112	"	14'-0"	"	560	56	224	14	5	4	15	8300	1200
B-97	25200	31500	63	9'-0"	7'-0"	10'-4"	315	28	126	7	4	3	7½	5150	725
B-98	28800	36000	72	"	8'-0"	"	360	32	144	8	5	4	7½	5725	925
B-99	32400	40500	81	"	9'-0"	"	405	36	162	9	5	4	10	6200	1000
B-910	36000	45000	90	"	10'-0"	"	450	40	180	10	5	4	10	6700	1000
B-911	39600	49500	99	"	11'-0"	"	495	44	198	11	5	4	15	7200	1200
B-912	43200	54000	108	"	12'-0"	"	540	48	216	12	5	4	15	8000	1200
B-913	46800	58500	117	"	13'-0"	"	585	52	234	13	5	4	15	8500	1200
B-914	50400	63000	126	"	14'-0"	"	630	56	252	14	5	4	15	9000	1200
B-915	54000	67500	135	"	15'-0"	"	675	60	270	15	6	5	15	9600	1500
B-916	57600	72000	144	"	16'-0"	"	720	54	288	16	6	5	15	10125	1500
B-107	28000	35000	70	10'-0"	7'-0	11'-4"	350	28	140	7	5	4	7½	5325	925
B-108	32000	40000	80	"	8'-0"	"	400	32	160	8	5	4	10	6075	1000
B-109	36000	45000	90	"	9'-0"	"	450	36	180	9	5	4	10	6600	1000
B-1010	40000	50000	100	"	10'-0"	"	500	40	200	10	5	4	15	7125	1200
B-1011	44000	55000	110	"	11'-0	"	550	44	220	11	5	4	15	7650	1200
B-1012	48000	60000	120	"	12'-0"	"	600	48	240	12	5	4	15	8500	1200
B-1013	52000	65000	130	"	13'-0"	"	650	52	260	13	6	5	15	9125	1500
B-1014	56000	70000	140	"	14'-0"	"	700	56	280	14	6	5	15	9700	1500
B-1015	60000	75000	150	"	15'-0"	"	750	60	300	15	6	5	20	10225	1650
B-1016	64000	80000	160	"	16'-0"	"	800	64	320	16	6	5	20	10750	1650
B-1017	68000	85000	170	"	17'-0"	"	850	68	340	17	6	5	20	11550	1650
B-1018	72000	90000	180	"	18'-0"	"	900	72	360	18	6	5	20	12150	1650
B-1019	76000	95000	190	"	19'-0"	"	950	76	380	19	6	5	20	12700	1650
B-1020	80000	100000	200	"	20'-0"	"	1000	80	400	20	8	6	25	13225	2100

The B&B Line of Massachusetts Air Washers



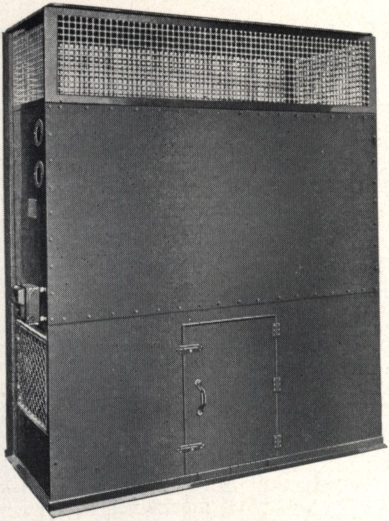
MASSACHUSETTS
COOLING TYPE AIR WASHER

The B&B Line of Massachusetts Air Washers

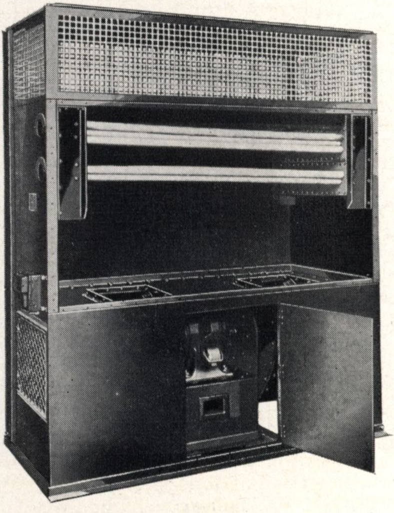
DATA AND DIMENSIONS
MASSACHUSETTS COOLING TYPE AIR WASHER

NO. OF WASHER	CAPACITY CUBIC FEET PER MIN		FREE AREA SQ. FT.	A	B	C	GALLONS PER. MINUTE			NO. NOZZLES		SIZE PUMP		H.P MOTOR	WEIGHT IN LBS.		
	400' VEL	500' VEL					SPRAY	FLOOD'G	COOLING	SPRAY	FLOOD'G	SUC.	DIS		WASHER	PUMP & MOTOR	ADD.FOOT COOLING SPACE
C-22	1600	2000	4	2'-0"	2'-0"	3'-4"	20	8	15	8	2	2	1½	2	1300	500	90
C-23	2400	3000	6	"	3'-0"	"	30	12	24	12	3	2	1½	3	1600	525	95
C-24	3200	4000	8	"	4'-0"	"	40	16	30	16	4	2	1½	3	1850	525	100
C-33	3600	4500	9	3'-0"	3'-0"	4'-4"	45	12	34	18	3	2½	2	3	1875	550	96
C-34	4800	6000	12	"	4'-0"	"	60	16	45	24	4	2½	2	3	2150	550	103
C-35	6000	7500	15	"	5'-0"	"	75	20	57	30	5	3	2½	5	2425	640	110
C-36	7200	9000	18	"	6'-0"	"	90	24	68	36	6	3	2½	5	2700	640	116
C-37	8400	10500	21	"	7'-0"	"	105	28	79	42	7	4	3	5	3000	675	124
C-43	4800	6000	12	4'-0"	3'-0"	5'-4"	60	12	45	24	3	2½	2	3	2075	550	100
C-44	6400	8000	16	"	4'-0"	"	80	16	60	32	4	3	2½	5	2375	640	107
C-45	8000	10000	20	"	5'-0"	"	100	20	75	40	5	3	2½	5	2675	640	114
C-46	9600	12000	24	"	6'-0"	"	120	24	90	48	6	4	3	5	3025	675	120
C-47	11200	14000	28	"	7'-0"	"	140	28	105	56	7	4	3	7½	3325	725	127
C-48	12800	16000	32	"	8'-0"	"	160	32	120	64	8	4	3	7½	3650	725	134
C-53	6000	7500	15	5'-0"	3'-0"	6'-4"	75	12	57	30	3	3	2½	5	2325	640	104
C-54	8000	10000	20	"	4'-0"	"	100	16	75	40	4	3	2½	5	2650	640	111
C-55	10000	12500	25	"	5'-0"	"	125	20	94	50	5	4	3	5	3000	675	118
C-56	12000	15000	30	"	6'-0"	"	150	24	113	60	6	4	3	7½	3550	725	124
C-57	14000	17500	35	"	7'-0"	"	175	28	131	70	7	4	3	7½	3900	725	131
C-58	16000	20000	40	"	8'-0"	"	200	32	150	80	8	5	4	7½	4300	925	138
C-59	18000	22500	45	"	9'-0"	"	225	36	168	90	9	5	4	10	4650	1000	145
C-64	9600	12000	24	6'-0"	4'-0"	7'-4"	120	16	90	48	4	4	3	5	3025	675	115
C-65	12000	15000	30	"	5'-0"	"	150	20	113	60	5	4	3	7½	3450	725	122
C-66	14400	18000	36	"	6'-0"	"	180	24	135	72	6	4	3	7½	4075	725	126
C-67	16800	21000	42	"	7'-0"	"	210	28	157	84	7	5	4	7½	4500	925	133
C-68	19200	24000	48	"	8'-0"	"	240	32	180	96	8	5	4	10	4925	1000	140
C-69	21600	27000	54	"	9'-0"	"	270	36	203	108	9	5	4	15	5300	1200	147
C-610	24000	30000	60	"	10'-0"	"	300	40	225	120	10	5	4	15	5700	1200	153
C-611	26200	33000	66	"	11'-0"	"	330	44	248	132	11	5	4	15	6125	1200	160
C-612	28800	36000	72	"	12'-0"	"	360	48	270	144	12	5	4	15	6525	1200	167
C-75	14000	17500	35	7'-0"	5'-0"	8'-4"	175	20	130	70	5	4	3	7½	3725	725	126
C-76	16800	21000	42	"	6'-0"	"	210	24	157	84	6	5	4	7½	4450	925	132
C-77	19600	24500	49	"	7'-0"	"	245	28	184	98	7	5	4	10	5075	1000	139
C-78	22400	28000	56	"	8'-0"	"	280	32	210	112	8	5	4	15	5550	1200	146
C-79	25200	31500	63	"	9'-0"	"	315	36	236	126	9	5	4	15	6000	1200	153
C-710	28000	35000	70	"	10'-0"	"	350	40	263	140	10	5	4	15	6495	1200	159
C-711	31800	38500	77	"	11'-0"	"	385	44	290	154	11	6	5	15	6950	1500	166
C-712	33600	42000	84	"	12'-0"	"	420	48	315	168	12	6	5	15	7575	1500	173
C-86	19200	24000	48	8'-0"	6'-0"	9'-4"	240	24	180	96	6	5	4	10	4900	1000	155
C-87	22400	28000	56	"	7'-0"	"	280	28	210	112	7	5	4	10	5525	1000	163
C-88	25600	32000	64	"	8'-0"	"	320	32	240	128	8	5	4	15	6050	1200	170
C-89	28800	36000	72	"	9'-0"	"	360	36	270	144	9	5	4	15	6600	1200	178
C-810	32000	40000	80	"	10'-0"	"	400	40	300	160	10	6	5	15	7075	1500	184
C-811	35200	44000	88	"	11'-0"	"	440	44	330	176	11	6	5	15	7550	1500	192
C-812	38400	48000	96	"	12'-0"	"	480	48	360	192	12	6	5	20	8275	1650	199
C-813	41600	52000	104	"	13'-0"	"	520	52	390	208	13	6	5	20	8750	1650	207
C-814	44800	56000	112	"	14'-0"	"	560	56	420	224	14	8	6	25	9300	2100	215
C-97	25200	31500	63	9'-0"	7'-0"	10'-4"	315	28	236	126	7	5	4	15	5925	1200	172
C-98	28800	36000	72	"	8'-0"	"	360	32	270	144	8	5	4	15	6525	1200	179
C-99	32400	40500	81	"	9'-0"	"	405	36	304	162	9	6	5	15	7050	1500	185
C-910	36000	45000	90	"	10'-0"	"	450	40	338	180	10	6	5	15	7600	1500	191
C-911	39600	49500	99	"	11'-0"	"	495	44	372	198	11	6	5	20	8100	1650	197
C-912	43200	54000	108	"	12'-0"	"	540	48	405	216	12	6	5	20	8950	1650	204
C-913	46800	58500	117	"	13'-0"	"	585	52	438	234	13	8	6	25	9475	2100	212
C-914	50400	63000	126	"	14'-0"	"	630	56	472	252	14	8	6	25	10050	2100	220
C-915	54000	67500	135	"	15'-0"	"	675	60	505	270	15	8	6	25	10675	2100	228
C-916	57600	72000	144	"	16'-0"	"	720	64	540	288	16	8	6	30	11200	2250	234
C-107	28000	35000	70	10'-0"	7'-0"	11'-4"	350	28	263	140	7	5	4	15	6375	1200	181
C-108	32000	40000	80	"	8'-0"	"	400	32	300	160	8	6	5	15	6975	1500	186
C-109	36000	45000	90	"	9'-0"	"	450	36	338	180	9	6	5	15	7525	1500	194
C-1010	40000	50000	100	"	10'-0"	"	500	40	375	200	10	6	5	20	8075	1650	200
C-1011	44000	55000	110	"	11'-0"	"	550	44	412	220	11	8	6	25	8625	2100	206
C-1012	48000	60000	120	"	12'-0"	"	600	48	450	240	12	8	6	25	9525	2100	213
C-1013	52000	65000	130	"	13'-0"	"	650	52	488	260	13	8	6	25	10200	2100	221
C-1014	56000	70000	140	"	14'-0"	"	700	56	525	280	14	8	6	25	10800	2100	227
C-1015	60000	75000	150	"	15'-0"	"	750	60	562	300	15	8	6	30	11350	2250	235
C-1016	64000	80000	160	"	16'-0"	"	800	64	600	320	16	8	6	30	12000	2250	243
C-1017	68000	85000	170	"	17'-0"	"	850	68	638	340	17	8	6	30	12800	2250	250
C-1018	72000	90000	180	"	18'-0"	"	900	72	675	360	18	8	6	30	13400	2250	258
C-1019	76000	95000	190	"	19'-0"	"	950	76	712	380	19	10	8	30	13950	2400	266
C-1020	80000	100000	200	"	20'-0"	"	1000	80	750	400	20	10	8	30	14500	2400	273
C-1021	84000	105000	210	"	21'-0"	"	1050	84	788	420	21	10	8	30	15100	2400	281
C-1022	88000	110000	220	"	22'-0"	"	1100	88	825	440	22	10	8	30	15650	2400	289
C-1023	92000	115000	230	"	23'-0"	"	1150	92	862	460	23	10	8	40	16200	2650	296
C-1024	96000	120000	240	"	24'-0"	"	1200	96	900	480	24	10	8	40	16800	2650	304

Massachusetts Type V Modified Unit Heater



ExteriorView



Side Panel Removed To Show Interior

The Massachusetts Type V Modified Unit Heater

The Bishop & Babcock line of Massachusetts Unit Heaters presents the latest, most efficient and economical means of heating and ventilating large areas, such as manufacturing plants, factory offices, gymnasiums, commercial garages, etc.

The design is in strict accordance with the fundamental laws of scientific air circulation. The unit, drawing cool air from a point just above the floor level, and discharging horizontally at high velocity just above the breathing or working zone, distributes the heated air in the breathing zone.

Heated air can be deflected downward by means of baffles, etc., but will rebound upward unless the cooler air, at the lower levels, is withdrawn. The air inlet of Massachusetts Unit Heaters, being just above the floor line, removes the lower strata of cool air, allowing the warmer strata in the breathing zone to fall, thus insuring a uniform temperature.

Distinctive features of Massachusetts Type V Unit Heaters

1—The design of the Unit Heater is such as to enhance the appearance of its surroundings, replacing unsightly units with an efficient, mechanically correct means of heating. Ornamental grilles of pleasing appearance replace the usual cowls, elbows and baffles.

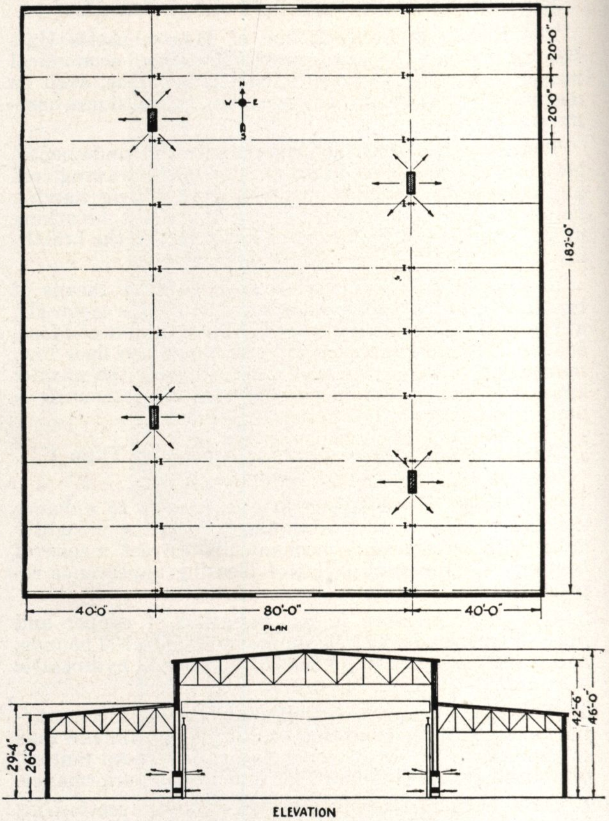
2—The high pressure finned radiation of copper and brass, is suitable for any steam pressure up to 100 pounds, and is tested before shipment to 200 pounds hydrostatic pressure.

3—The Massachusetts Unit Heater is of rigid construction and silent in operation, featuring multiblade fans of high efficiency, direct connected to low speed motors, establishing a new standard for unit heater performance.

4—At a slight increase in price, the Massachusetts Unit Heater can be furnished with air filters of approved design built into the unit, insuring a circulation of air at least 98% clean, and arranged with double connected Louvre dampers so that air may be drawn from out of doors or recirculated as desired.

5—Positive control of heat is assured at all times. This may be accomplished by manual control or by means of the Bishop & Babcock System of Automatic Temperature Regulation, insuring constant and uniform temperatures in all areas.

6—Massachusetts Unit Heaters are shipped assembled, ready for operation. When in position, only steam and electrical connections are necessary. Being designed for floor mounting, no elaborate foundations or supports are necessary.



TYPICAL LAYOUT MASSACHUSETTS TYPE V MODIFIED UNIT HEATERS IN MANUFACTURING BUILDING.

Advantages of the Massachusetts Type V Unit System of Heating

The Massachusetts Unit System of Heating, as compared to the Direct Radiation System, effects numerous advantages and savings, both in first cost and in operating and maintenance expense, for the following reasons:

The First cost will be from twenty to forty per cent less, as the radiation used in Massachusetts Unit Heaters has more than five times the heating efficiency of direct radiation, and the elaborate piping system necessary in the use of direct radiation is omitted.

Advantages of the Massachusetts Type V Unit System of Heating

An even distribution of heat is assured, eliminating the necessity of maintaining a temperature at the ceiling 15° to 20° in excess of that desired at the breathing zone.

Each heater is a self contained unit, and can be shut off when not required. Heat supply for each section of the building is, therefore, controlled at will.

Due to the type of radiation used, the heating effect of Massachusetts Unit Heaters is almost instantaneous. The heating up period, in the morning, is reduced to a fraction of that required with a direct radiation system.

The cost of maintenance is reduced to a minimum, due to the rigid construction of the unit and practical elimination of expansion and contraction found in long runs of coil or wall radiation. Ventilation as well as heating is secured. The system can be so arranged that any portion of the air displaced can be drawn from out of doors, effecting an ideal Heating and Ventilating System during the colder months, and a Ventilation System in the summer.

Construction Details of Massachusetts Type V Unit Heaters

Fans:

Two standard Massachusetts Modified Squirrel Cage Fans, mounted on same shaft, are used. The casings are of blue annealed open hearth steel strongly braced, bolted and riveted. The wheels are designed to combine rigid construction and great strength, together with efficient and noiseless operation.

Motor:

Motors of standard manufacture are used, fitted with double shaft extension for direct connection to fans. Arrangement has been made for oiling motors from outside by means of oil sights on heater casings.

Starter:

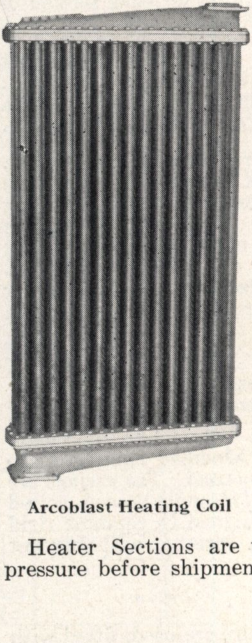
Starting switches are regularly furnished as standard equipment, and are mounted on side of heater casing.

Casing:

The casing is constructed of blue annealed open hearth steel, mounted on a rigid structural steel frame, and fitted with access door and removable side panels. The casing is furnished with lace pattern steel grilles for distributing the heated air in three or four directions as desired.

Heating Coils:

Radiation used in all types of Massachusetts Unit Heaters is the Arcoblast Heating Coil furnished in three, four or five tubes deep, and one or two sections, depending on size of heater and requirements of the particular installation.



Arcoblast Heating Coil

The heater consists of heavy ¾″ copper tubes. Each tube is wrapped with a thin copper radial fin, giving a helical form. These fins, which are tinned to the tubes to insure a perfect bond, are of proper width to give maximum heat transfer with minimum tube spacing, and the pitch of the helix is such as to give maximum surface without undue air resistance.

The tubes are mounted between heavy cast iron tube sheets and rolled into holes in these sheets to insure a leak proof joint under all operating conditions.

The headers are of close grain cast iron, the return header having eccentric tapping to prevent accumulation of condensate in the heater section.

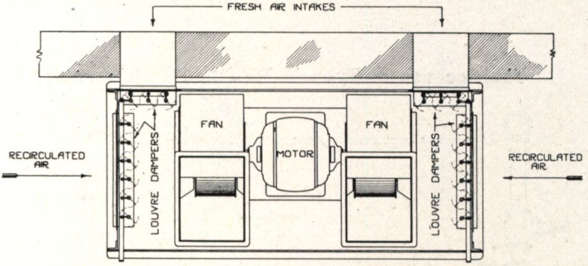
Heater Sections are tested at 200 pounds hydraulic pressure before shipment.

The Massachusetts Type V F Modified Unit Heater

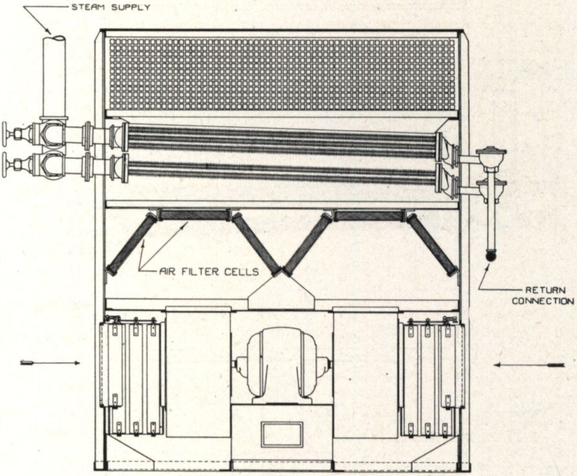
The Massachusetts Type V F Modified Unit Heater presents an innovation in the unit heating field, presenting a unit in which is incorporated, as standard equipment, a positive and effective means of removing all dirt, dust, soot and other impurities in the incoming or recirculated air, and a system of damper control, either manual or automatic, which permits any portion of the air to be drawn from out of doors or recirculated from the building as desired.

Massachusetts Type V F Modified Unit Heater

The filtering media consists of filter cells of standard manufacture fitted in the unit, and arranged for easy removal for cleaning.



PLAN

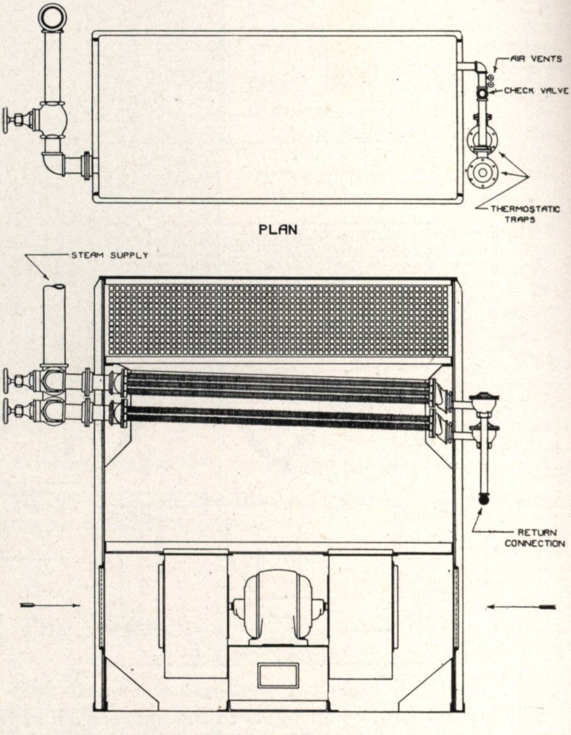


SECTIONAL ELEVATION

The arrangement of air inlets to the unit is such as to permit installation along outer walls, or the unit may be installed in any other manner with fresh air intake ducts extending to outside of building.

The Massachusetts Type V F Modified Unit Heater can be furnished with Humidifiers, Bishop & Babcock Humidity Control, and the Bishop & Babcock System of Temperature Regulation to suit air conditioning requirements of the particular installation.

Massachusetts Type V Modified Unit Heater

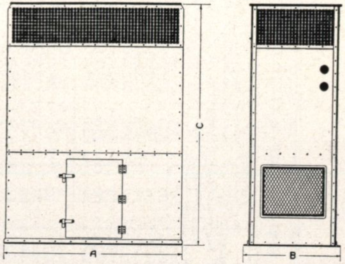


DIMENSIONS AND PHYSICAL DATA

Heater Size	Principal Dimensions			Capacity C. F. M. @ 68° F	Size Tapping		Steam Connections		
	A	B	C		Supply	Return	Supply	Return	
								Gravity	Vacuum
353	3'-10"	3'-2"	7'- 8"	3500	1-3"	1-1"	3"	1½"	1"
354	3'-10"	3'-2"	7'- 8"	3400	2-3"	2-1"	3½"	1½"	1"
355	3'-10"	3'-2"	7'- 8"	3300	2-3"	2-1"	3½"	2"	1¼"
503	5'- 4"	3'-2"	7'- 8"	5300	1-3"	1-1¼"	3½"	1½"	1¼"
504	5'- 4"	3'-2"	7'- 8"	5150	2-3"	2-1¼"	4"	2"	1¼"
505	5'- 4"	3'-2"	7'- 8"	5000	2-3"	2-1¼"	4"	2"	1¼"
623	5'-10"	3'-2"	7'- 9"	6400	1-3"	1-1¼"	4"	2"	1¼"
624	5'-10"	3'-2"	7'- 9"	6275	2-3"	2-1¼"	4"	2"	1¼"
625	5'-10"	3'-2"	7'- 9"	6150	2-3"	2-1¼"	4½"	2½"	1¼"
753	6'-10"	3'-2"	7'-10¼"	7680	1-3"	1-1¼"	4"	2"	1¼"
754	6'-10"	3'-2"	7'-10¼"	7470	2-3"	2-1¼"	4½"	2½"	1¼"
755	6'-10"	3'-2"	7'-10¼"	7200	2-3"	2-1¼"	4½"	2½"	1½"
903	7'- 4"	3'-2"	7'-10¼"	9360	1-3"	1-1½"	4"	2"	1¼"
904	7'- 4"	3'-2"	7'-10¼"	9160	2-3"	2-1¼"	4½"	2½"	1½"
905	7'- 4"	3'-2"	7'-10¼"	9000	2-3"	2-1½"	4½"	2½"	1½"

Heater Size	Dia. Fan Wheels	R. P. M.	B. H. P.	H. P. Motor	RADIATION DATA			Shipping Weight
					Rows Tubes Deep	Length Tubes	Lin. Ft. Tubing	
353	12"	1150	1.48	1½	3	31"	114'	1800
354	12"	1150	1.44	1½	4	31"	150	1950
355	12"	1150	1.40	1½	5	31"	189	1980
503	15"	690	1.30	1½	3	49"	180	2350
504	15"	690	1.28	1½	4	49"	238	2500
505	15"	690	1.25	1½	5	49"	299	2530
623	15"	850	2.04	2½	3	55"	202	2400
624	15"	850	2.00	2½	4	55"	266	2600
625	15"	850	1.95	2½	5	55"	335	2640
753	18"	570	1.88	2	3	67"	246	2750
754	18"	570	1.86	2	4	67"	324	2960
755	18"	570	1.80	2	5	67"	408	3000
903	18"	690	3.19	4	3	73"	268	3050
904	18"	690	3.16	4	4	73"	354	3250
905	18"	690	3.12	4	5	73"	445	3300

MASSACHUSETTS
TYPE V MODIFIED UNIT HEATER

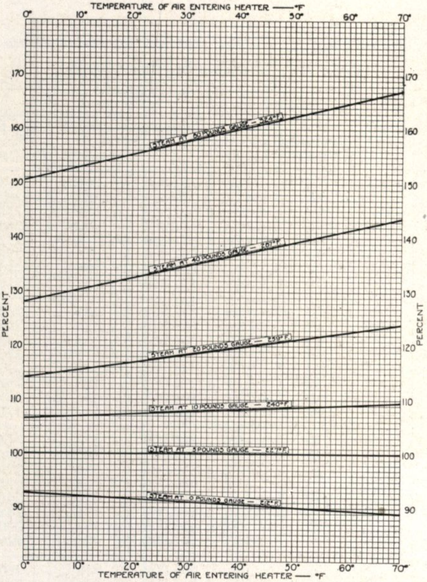


STEAM AT 227° & 5 POUNDS GAUGE

Heater Size	Capac. C.F.M.	Temperature		B. T. U. Emission Per Hour	Cond. Per Hour Pounds	Equiv. Sq. Ft. Direct Radiation
		Air Entering Heater	Air Leaving Heater			
353	3550	0°	76°	291,000	304	1160
	3600	10	83	279,000	290	1115
	3645	20	90	266,000	277	1060
	3690	30	97	253,000	264	1010
	3735	40	103	240,000	250	960
	3780	50	110	228,000	237	910
	3820	60	116	213,000	222	850
	3975	70	123	200,000	210	800
354	3580	0	96	357,000	372	1430
	3620	10	102	340,000	354	1360
	3660	20	108	325,000	338	1300
	3695	30	113	309,000	322	1235
	3725	40	119	293,000	306	1170
	3770	50	125	277,000	289	1110
	3800	60	131	261,000	272	1040
	3840	70	137	245,000	256	980
355	3600	0	115	415,000	433	1660
	3630	10	120	396,000	413	1585
	3650	20	124	378,000	393	1510
	3690	30	130	360,000	376	1440
	3720	40	135	343,000	357	1370
	3750	50	140	324,000	338	1295
	3780	60	145	305,000	318	1220
	3810	70	150	287,000	299	1145
503	5380	0	77	452,000	470	1800
	5460	10	84	430,000	448	1720
	5540	20	91	410,000	426	1640
	5600	30	97	390,000	406	1560
	5660	40	104	371,000	386	1480
	5730	50	111	352,000	366	1405
	5800	60	117	330,000	344	1320
	5860	70	124	311,000	324	1240
504	5450	0	98	552,000	575	2200
	5510	10	104	528,000	550	2110
	5560	20	109	504,000	525	2015
	5610	30	115	480,000	500	1920
	5670	40	121	454,000	473	1815
	5720	50	126	428,000	447	1715
	5770	60	132	404,000	421	1615
	5840	70	138	380,000	396	1520
505	5470	0	117	638,000	665	2550
	5520	10	122	613,000	639	2450
	5560	20	127	582,000	607	2330
	5600	30	132	556,000	579	2220
	5660	40	137	528,000	590	2110
	5700	50	141	500,000	520	2000
	5740	60	146	471,000	491	1885
	5790	70	151	442,000	460	1765
623	6500	0	76	528,000	550	2110
	6580	10	83	504,000	525	2020
	6660	20	90	485,000	505	1940
	6740	30	96	458,000	478	1830
	6820	40	103	436,000	454	1740
	6900	50	110	415,000	433	1660
	6980	60	116	388,000	405	1550
	7060	70	123	367,000	382	1465
624	6600	0	96	646,000	673	2580
	6670	10	101	620,000	645	2480
	6740	20	107	590,000	615	2360
	6820	30	113	560,000	584	2240
	6890	40	119	533,000	555	2130
	6960	50	125	504,000	525	2020
	7025	60	130	474,000	494	1895
	7090	70	136	447,000	465	1780

STEAM AT 227° & 5 POUNDS GAUGE

Heater Size	Capac. C.F.M.	Temperature		B. T. U. Emission Per Hour	Cond. Per Hour Pounds	Equiv. Sq. Ft. Direct Radiation
		Air Entering Heater	Air Leaving Heater			
625	6690	0°	114°	765,000	797	3050
	6750	10	119	730,000	762	2920
	6810	20	124	697,000	726	2780
	6870	30	129	664,000	692	2650
	6920	40	134	632,000	658	2520
	6980	50	139	597,000	622	2380
	7040	60	144	563,000	587	2250
	7090	70	148	530,000	552	2120
753	7790	0	76	637,000	664	2550
	7900	10	83	608,000	634	2430
	8000	20	90	583,000	606	2330
	8100	30	96	552,000	575	2210
	8200	40	103	526,000	548	2100
	8300	50	110	496,000	517	1980
	8400	60	116	468,000	487	1870
	8500	70	123	440,000	459	1760
754	7860	0	96	785,000	816	3140
	7950	10	102	750,000	780	3000
	8040	20	108	715,000	745	2860
	8130	30	114	680,000	708	2720
	8220	40	120	646,000	674	2580
	8300	50	125	610,000	635	2440
	8375	60	130	575,000	598	2300
	8450	70	136	542,000	564	2160
755	7850	0	115	902,000	940	3600
	7920	10	120	865,000	900	3450
	7980	20	125	825,000	860	3300
	8050	30	130	785,000	819	3140
	8125	40	135	745,000	776	2980
	8190	50	140	706,000	735	2820
	8260	60	145	667,000	695	2660
	8330	70	150	625,000	650	2500
903	9450	0	73	745,000	775	2980
	9580	10	80	713,000	742	2860
	9700	20	87	678,000	707	2720
	9825	30	94	646,000	672	2580
	9950	40	100	613,000	639	2450
	10050	50	107	581,000	605	2320
	10180	60	114	545,000	568	2180
	10320	70	121	515,000	537	2060
904	9560	0	92	919,000	956	3670
	9710	10	99	880,000	917	3520
	9820	20	105	843,000	878	3370
	9920	30	111	796,000	830	3180
	10000	40	116	758,000	790	3030
	10100	50	122	718,000	748	2880
	10200	60	128	677,000	705	2710
	10310	70	134	637,000	663	2540
905	9725	0	110	1,080,000	1125	4330
	9810	10	115	1,030,000	1072	4150
	9910	20	121	988,000	1028	3950
	10000	30	126	940,000	980	3760
	10100	40	132	895,000	932	3580
	10200	50	137	846,000	880	3380
	10300	60	142	800,000	833	3200
	10390	70	147	748,000	778	2990



Percentage Curves showing changes in B. T. U. Emission of Massachusetts Unit Heaters for Various Steam Pressures and Temperatures of entering air.

Based on 5 lbs. Gauge 227° F. as 100.

NOTE—To obtain B. T. U. Emission of any size Massachusetts Unit Heater at any steam pressure and entering air temperature, multiply percentage constant from curve by basic rating in B. T. U.'s at 5 lbs. steam which is given in tables on pages 204, 205, 209, 211 and 213.

The capacity ratings given above are average results of a series of tests conducted as follows:

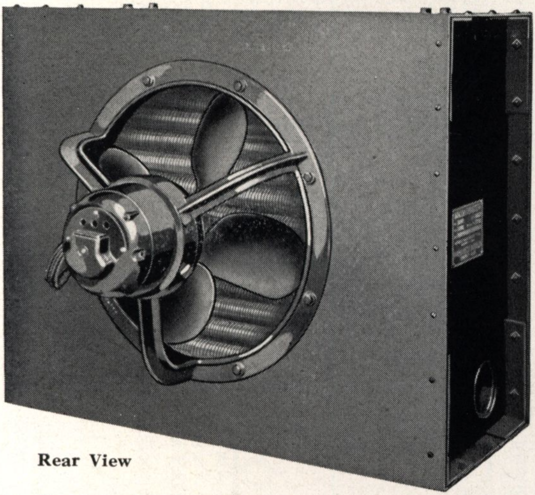
1—Five pounds steam 227° F. maintained constant in heater. Pressure determined by a steam thermometer, heater air vented, gravity return.

2—Dry saturated steam supplied. Separator and trap in supply main to remove entrained water.

3—Condensation discharged to receptacle on platform scales where it is weighed. Cooling leg on return to reduce re-evaporation to a minimum.

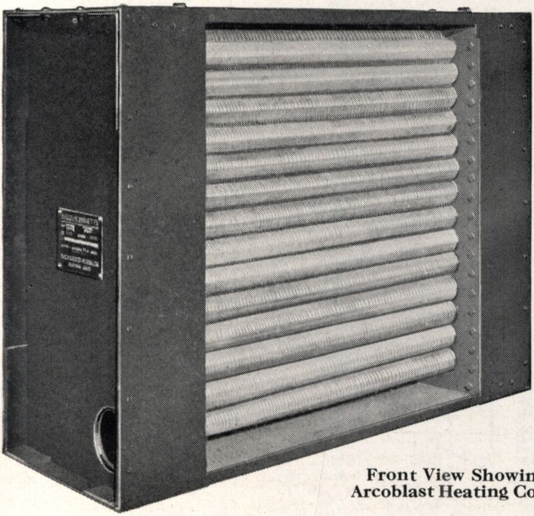
4—B. T. U. and air quantities calculated from condensation and air temperatures. Entering and final temperatures of air recorded as an average over air inlet and outlet areas.

Massachusetts Type H Modified Unit Heater



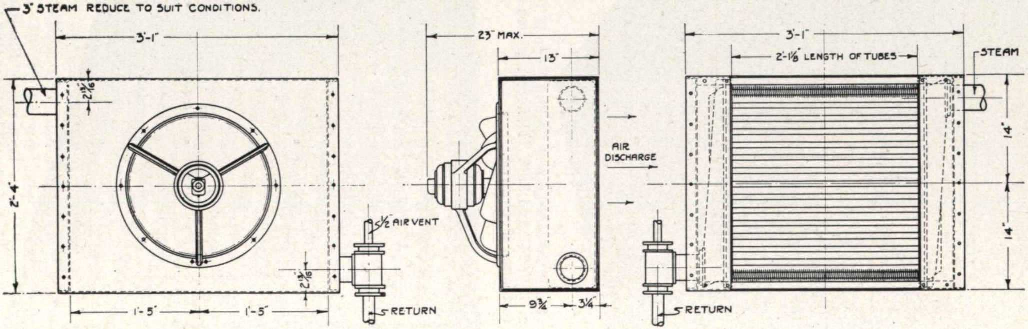
Rear View

Where floor space is not available we recommend Ceiling Type H Unit Heaters, built in three sizes, 18″, 24″ and 30″. Deflector plates and re-circulating boxes can be furnished if required.



Front View Showing Arcoblast Heating Coils

Type "H" Modified Unit Heater Size 18



PHYSICAL DATA

Fan:—18″ Super Hi-Lo Massachusetts Electric Propeller Fan.

Motor:—Totally enclosed automatically lubricated.

Heater:—No. 25—¾″ copper tubes, 1½″ copper helical fins, cast iron header and tube sheet, with tubes rolled into holes in tube sheets.

Standard type for steam pressures to 50 pounds.

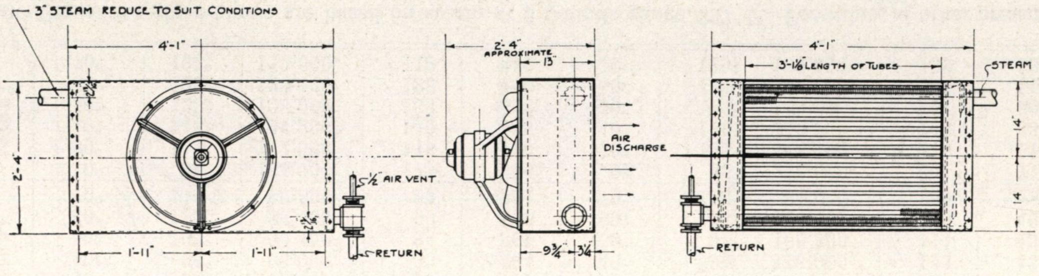
[High pressure type for steam pressures to 150 pounds.

PERFORMANCE DATA — TYPE H MODIFIED UNIT HEATER SIZE 18

Depth of Heater	1/10 H. P.—850 R. P. M. 1650 CUBIC FEET OF AIR PER MINUTE					1/6 H. P.—1150 R. P. M. 2200 CUBIC FEET OF AIR PER MINUTE				
	Temperature Rise		B. T. U. Per Hr.	Condensate Per Hr.	Equiv. Sq. Ft. Direct Radiation	Temperature Rise		B. T. U. Per Hr.	Condensate Per Hr.	Equiv. Sq. Ft. Direct Radiation
	From	To				From	To			
2 Rows Tubes	0°	68°	116,000	121	465	0°	61°	136,200	142	545
	30°	89°	101,000	105	405	30°	82°	119,000	124	476
	40°	96°	96,000	100	384	40°	90°	113,000	118	452
	50°	103°	90,400	94	361	50°	97°	106,900	111	428
	60°	110°	86,400	90	345	60°	104°	100,800	105	404
	70°	117°	80,500	84	321	70°	112°	95,000	99	380
3 Rows Tubes	0°	95°	164,000	170	656	0°	85°	193,000	201	775
	30°	112°	142,000	148	570	30°	104°	168,500	176	675
	40°	118°	134,200	140	538	40°	110°	159,000	165	638
	50°	123°	128,000	133	513	50°	116°	151,000	157	605
	60°	129°	120,000	125	480	60°	123°	142,000	148	568
	70°	135°	113,000	118	452	70°	129°	133,500	139	535

Note:—Capacities given above are based on steam at 5 pounds gauge, 227° F. For values at other pressures, multiply capacity given above by constant to be found in percentage curves, page 206.

Type H Modified Unit Heater Size 24



PHYSICAL DATA

Fan:—24″ Super Hi-Lo Massachusetts Electric Propeller Fan.

Motor:—Totally enclosed, automatically lubricated.

Heater:—No. 37—3/4″ copper tubes, 1 1/2″ copper helical fins, cast iron header and tube sheet, with tubes rolled into holes in tube sheets.

Standard type for steam pressures to 50 pounds.

High pressure type for steam pressures to 150 pounds.

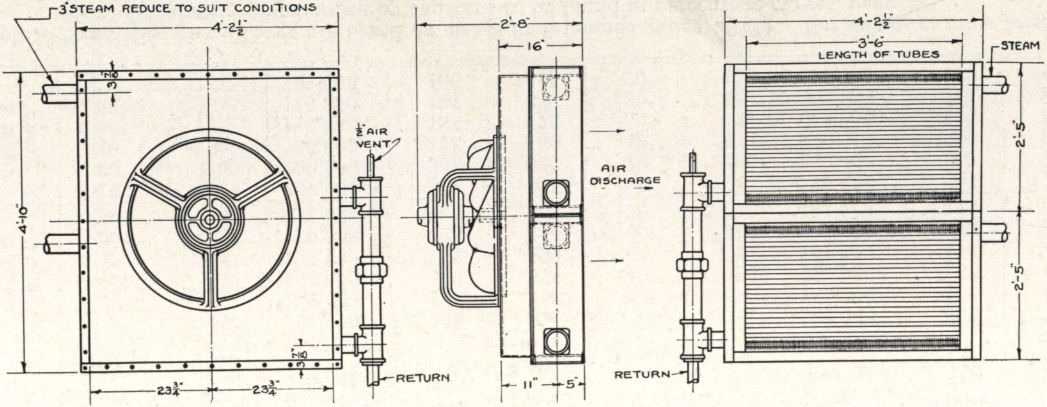
PERFORMANCE DATA

TYPE H MODIFIED UNIT HEATER SIZE 24

Depth of Heater	¼ H. P.—670 R. P. M. 2350 CUBIC FEET OF AIR PER MINUTE					⅓ H. P.—850 R. P. M. 3000 CUBIC FEET OF AIR PER MINUTE				
	Temperature Rise		B. T. U. Per Hr.	Condensate Per Hr.	Equiv. Sq. Ft. Direct Radiation	Temperature Rise		B. T. U. Per Hr.	Condensate Per Hr.	Equiv. Sq. Ft. Direct Radiation
	From	To				From	To			
2 Rows Tubes	0°	69°	162,000	169	650	0°	62°	194,000	202	775
	30°	90°	142,000	148	568	30°	83°	169,000	176	675
	40°	97°	134,000	140	535	40°	91°	160,000	167	640
	50°	104°	127,000	132	509	50°	98°	151,800	158	608
	60°	111°	120,000	125	480	60°	105°	143,000	149	572
	70°	118°	113,000	118	453	70°	113°	134,200	140	537
3 Rows Tubes	0°	97°	231,000	241	925	0°	87°	275,000	287	1100
	30°	114°	200,000	208	798	30°	105°	240,000	250	960
	40°	120°	190,000	198	760	40°	111°	226,000	236	905
	50°	125°	180,000	188	722	50°	117°	215,000	224	860
	60°	131°	170,000	177	680	60°	124°	202,000	211	808
	70°	137°	159,500	166	635	70°	130°	191,000	199	765

Note:—Capacities given above are based on steam at 5 pounds gauge, 227° F. For values at other pressures, multiply capacity given above by constant to be found in percentage curves, page 206.

Type "H" Modified Unit Heater Size 30



PHYSICAL DATA

Fan:—30″ Type "R" Massachusetts Electric Propeller Fan.
Motor:—Totally enclosed, automatically lubricated.
Heater:—2 Units aerofin 3 rows deep, tubes 3′6″ long.

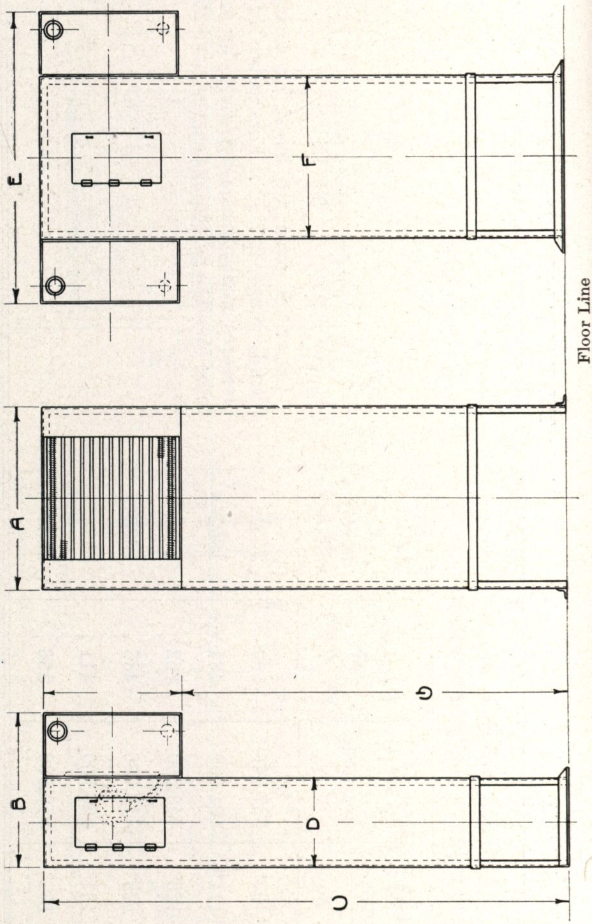
½ H. P.—670 R. P. M.
5400 Cubic Feet of Air Per Minute

Temperature Rise		B. T. U. per hour	Condensate per hour	Equiv. Sq. Feet direct radiation
From	To			
0°	97°	537,000	560	2150
30°	114°	464,000	484	1852
40°	120°	443,000	462	1770
50°	125°	418,000	436	1673
60°	131°	394,500	411	1580
70°	137°	370,500	386	1480

NOTE

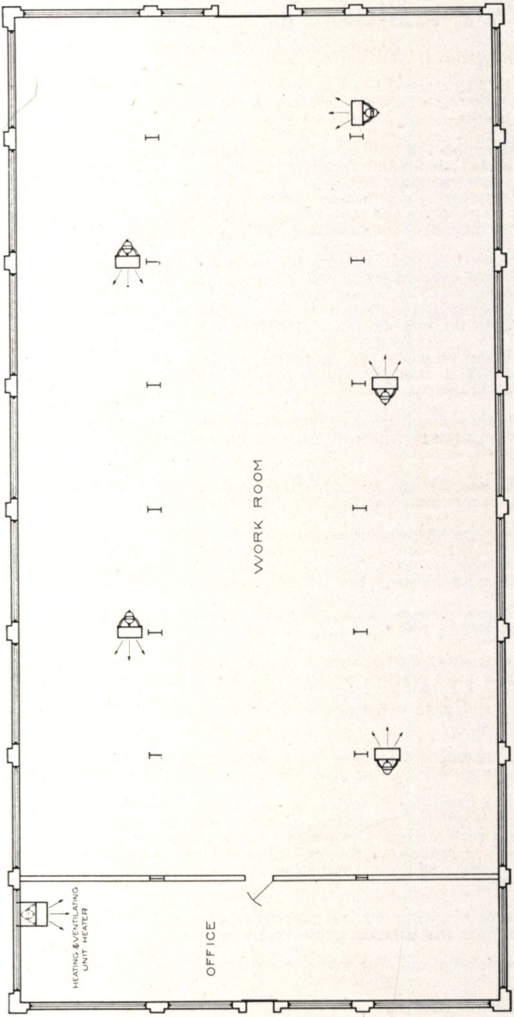
Capacities given are based on steam at 5 pounds gauge, 227° F. For values at other pressures multiply capacity given by constant to be found in percentage curves, page 206.

Single and Double Recirculating Boxes For Ceiling Type "H" Unit Heaters



Size	A	B	C	D	E	F	G	H	Shipping Weight
18″	37″	31″	106″	18″	58″	32″	78″	28″	
24″	49″	31″	106″	18″	58″	32″	78″	28″	

Typical Layout Massachusetts Ceiling Type "H" Unit Heaters.



PLAN OF TYPICAL SMALL MANUFACTURING PLANT HEATED AND VENTILATED BY MASSACHUSETTS TYPE 'H' UNIT HEATER

Computing Heat Loss

The B. T. U. Method is the only Accurate Means of Estimating Heat Losses

The B.T.U. method is not so difficult as it may seem and is the only proper way to be followed by all who are interested in obtaining accurate results.

To determine the total heat loss or cooling effect from a room when the room is to be maintained at a certain point in the coldest outside temperature, we find this total heat loss represents the amount of heat that must be supplied by the radiator, and knowing the amount of heat given off by one square foot of radiating surface, it is a simple matter to determine the necessary size of the radiator.

The heat loss from a room is obtained by determining the loss through the exposed walls and glass surfaces and the loss through air leakage, which is known as the number of air changes. This loss is expressed in B T.U. per hour for one degree of difference in temperature on the two sides of material.

The tables on pages 192, 193, 194, and 195 show factors or co-efficient of B.T.U. loss per square foot of exposed surface per degree difference in temperature.

To obtain the multiplier or factor required, multiply the co-efficient by the temperature difference between the inside and outside of room to be heated.

To the loss through wall and glass must be added the loss through leakage, or air change, as it is usually termed.

To raise the temperature of one cubic foot of air one degree requires .02056 B.T.U.; therefore, the volume of the room times the number of air changes per hour, times .02056, gives the heat loss for each degree difference between the outside and inside temperatures.

The losses through wall, glass and leakage added together give the total B.T.U. loss that must be supplied by radiation.

The character of the surface of the radiation determines its efficiency and from practice we have found that ordinary cast iron radiators will transmit 250 B.T.U. per square foot per hour, while wall radiators and coils will transmit as high as 300 B.T.U. per square foot per hour.

Assuming cast iron radiators are to be used, dividing the 250 B.T.U. into the total B.T.U. loss gives the radiation required in the room.

It is also necessary to take into consideration the exposure of each room and when the amount of radiation required has been figured, the rooms with a north and west exposure generally require an additional 10% of radiation. Rooms heated at long intervals only require as high as 30% additional radiation as compared with rooms heated constantly.

Designing of piping requires experience, care and study, and unless skillfully done will produce questionable results.

Where point of question arises, consult the B&B Engineers.

Temperature for Estimating Direct Radiation

Heating and Ventilating are the production of artificial climate usually in a well defined confined space, or group of rooms. With surrounding local Climatic conditions understood and considered, it is necessary to know what temperatures are encountered, desirable and otherwise in buildings of various types. There is considerable difference in opinion on this matter but the following tabulation will be found to be representative, usable and not arbitrary in any way.

Residences

Living Rooms	70°
Dining Rooms	70°
Kitchen	60-65°
Bath Rooms	75-80°
Bed Rooms	70°
Play Rooms	65°
Toilets	60°
Vestibules	60°
Halls, Lower	70°
Halls, Upper	65°
Sun Porch	70°
Sewing Room	75°
Billiard Room	65°
Pantry	60°

Commercial & Club Bldgs.

Offices, General	70°
Stores, Small	70°
Stores, Large	65°
Work Rooms	60-65°
Garage	55°
Steam Baths	113°
Warm Air Baths	122°
Hot Air Baths	140°
Treatment Rooms	80°
Hot House	75°
Ball Rooms	65°

Hospitals

Wards	75°
Private Rooms	80°
Operating Room	98°
Sun Rooms	70°
Reception Rooms	70°
Dressing Rooms	75°
Offices	70°
Bath Rooms	80°

Schools & Churches

Class Rooms	70°
Library	70°
Wardrobe	60°
Manual Training	65°
Laboratories	68°
Offices	70°
Auditorium	65°
Gymnasium	55°
Dressing Rooms	75°
Swimming Pool Room	75°
Toilets	65°
Corridors	60°
Kitchens	60°
Dining Rooms	65°

Miscellaneous

Prisons Day Confinement	65°
Prisons Night Confinement	55°
Closed Rooms not Heated but between Heated Rooms	40°
Unheated Vestibules	23°
Unexcavated Space Under Heated Room	32°
Attic Space Beneath Shingle or Slate Roof	15°
Attic Space Beneath Concrete or Composition	25°
Machine Shops	70°
Shops, Stores	65°
Foundries	50°

B. T. U. Transmitted per Square Foot per Hour per Degree Difference in Temperature through various Materials and Types of Exposed Building Construction.

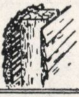
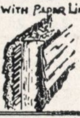
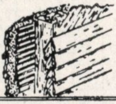
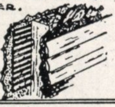
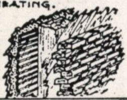
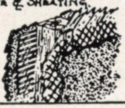
Kind of Material and Construction	Thickness of Material	B.T.U. Transmitted per Sq. Ft of Surface							
		Difference in Temperature							
		1°	50°	55°	60°	65°	70°	75°	80°
NOT FURRED OR PLASTERED	4 in	.59	30	32	35	38	41	44	47
	8½ "	.42	21	23	25	27	29	32	34
	13 "	.32	16	18	19	21	22	24	26
	17½ "	.26	13	14	16	17	18	20	21
	22 "	.22	11	12	13	14	15	17	18
	26½ "	.19	10	10	11	12	13	14	15
	31 "	.16	8	9	10	10	11	12	13
PLASTERED ONE SIDE	4 "	.56	28	31	34	36	39	42	45
	8½ "	.40	20	22	24	26	28	30	32
	13 "	.30	15	17	18	20	21	23	24
	17½ "	.24	12	13	14	16	17	18	19
	22 "	.20	10	11	12	13	14	15	16
	26½ "	.18	9	10	11	12	13	14	14
	31 "	.15	8	8	9	10	11	11	12
AIR SPACE AND PLASTER ONE SIDE	8½ "	.26	13	14	16	17	18	20	21
	13 "	.22	11	12	13	14	15	17	18
	17½ "	.19	10	10	11	12	13	14	15
	22 "	.16	8	9	10	10	11	12	13
	26½ "	.14	7	8	8	9	10	11	11
	31 "	.12	6	7	7	8	8	9	10
FURRED AND PLASTERED	4 "	.34	17	19	20	22	24	26	27
	8½ "	.27	14	15	16	18	19	20	22
	13 "	.22	11	12	13	14	15	17	18
	17½ "	.19	10	10	11	12	13	14	15
	22 "	.16	8	9	10	10	11	12	13
	26½ "	.14	7	8	8	9	10	11	11
	31 "	.12	6	7	7	8	8	9	10

B.T.U. Transmitted per Square Foot per Hour per Degree Difference in Temperature through various Materials and Types of Exposed Building Construction.

Kind of Material and Construction	Thickness of Material	B.T.U. Transmitted per Sq. Ft. of Surface							
		Difference in Temperature							
		1°	50°	55°	60°	65°	70°	75°	80°
Stone and Plaster	12 in	.48	24	26	29	31	34	36	38
	16 "	.43	22	24	26	28	30	32	34
	20 "	.38	19	21	23	25	27	29	30
	24 "	.35	18	19	21	23	25	26	28
	28 "	.31	16	17	19	20	22	23	25
	32 "	.28	14	15	17	18	20	21	22
	36 "	.25	13	14	15	16	18	19	20
Concrete and Plaster	8 "	.50	25	28	30	33	35	38	40
	12 "	.44	22	24	26	29	31	33	35
	16 "	.37	19	20	22	24	26	28	30
	20 "	.33	17	18	20	21	23	25	26
	24 "	.31	16	17	19	20	22	23	25
Brick Facing on Concrete and Plaster	4 "	.50	25	28	30	33	35	38	40
	8 "	.43	22	24	26	28	30	32	34
	12 "	.39	20	21	23	25	27	29	31
	16 "	.35	18	19	21	23	25	26	28
	20 "	.31	16	17	19	20	22	23	25
	24 "	.27	14	15	16	18	19	20	22
Brick Facing on Hollow Tile and Plaster	4 "	.23	12	13	14	15	16	17	18
	6 "	.21	11	12	13	14	15	16	17
	8 "	.18	9	10	11	12	13	14	14
	10 "	.16	8	9	10	10	11	12	13
	12 "	.14	7	8	8	9	10	11	11
Terra Cotta Facing on Brick and Plaster	4" TC-4" B	.24	12	13	14	16	17	18	19
	4" TC-8" B	.20	10	11	12	13	14	15	16
	8" TC-8" B	.17	9	9	10	11	12	13	14
	8" TC-12" B	.14	7	8	8	9	10	11	11
	12" TC-8" B	.10	5	6	6	7	7	8	8

B.T.U. Transmitted per Square Foot per Hour per Degree Difference in Temperature through various Materials and Types of Exposed Building Construction.

For Walls of Frame Buildings, Lath and Plaster Inside, Outside as Below.

Kind of Material and Construction		B.T.U. Transmitted per Sq. Ft. of Surface							
		Difference in Temperature							
		1°	50°	55°	60°	65°	70°	75°	80°
Ordinary Overlapping Clap Board Siding. 		.45	23	25	27	29	31	34	36
Same with Paper Lining. 		.32	16	18	19	21	22	24	26
Same with Sheating. 		.29	15	16	17	19	20	22	23
Same with Sheating and Paper. 		.24	12	13	14	16	17	18	19.
Brick Veneer and Sheating. 		.21	11	12	13	14	15	16	17
Stucco, Wire Lath, Air Space & Sheating. 		.23	12	13	14	15	16	17	18

B.T.U. Transmitted per Square Foot per Hour per Degree Difference in Temperature through various Materials and Types of Exposed Building Construction

	KIND OF MATERIAL AND CONSTRUCTION	B. T. U. Transmitted per Sq. Ft. of Surface							
		Difference in Temperature							
		1°	50°	55°	60°	65°	70°	75°	80°
PORTABLE WALLS	Corrugated Iron on ½″ Board	.48	24	26	29	31	34	36	38
	" " " 1" "	.38	19	21	23	25	27	29	30
	" " " 1½″ "	32	16	18	19	21	22	24	26
	" " " 2″ "	27	14	15	16	18	19	20	22
	" " " 2½″ "	.24	12	13	14	16	17	18	19
	" " Only	1.2	60	66	72	78	84	90	96
GLASS	Plate	74	37	41	44	48	52	56	59
	Single	1.05	53	52	63	68	74	79	84
	Double	49	25	27	29	32	34	37	39
	Single Skylight	1 13	57	62	68	73	79	85	90
	Double Skylight	55	28	30	33	36	39	41	44
	Steel Sash Wire Mesh	1.22	61	67	73	79	85	92	98
	Monitor	1 31	66	72	79	85	92	98	105
	Side Walk Prism	1 45	73	80	87	94	102	109	116

The amount in square feet of each kind of surface is to be multiplied by its respective constant as shown above, and by the difference in temperature between inside and outside air, The sum of the above B.T.U. gives the loss of heat by exposure. Add to the above as follows:

Ten per cent for northern exposure and where the winds are to be counted on as an important factor.

Ten per cent if heated day time only, and the location of the building is not exposed.

Twenty per cent when the building is heated day time only, and the location of the building is exposed.

Thirty per cent when the building is heated during winter months intermittently with long intervals of non-heating.

With glass and skylight it is desirable to consider single thickness in all cases, owing to the fact that the single thickness may be substituted by the building contractor without the knowledge of the owner, or it may be substituted by the owner to save cost, or even if double thick be installed at first, it may in time become broken and be replaced with single-thickness glass.

B.T.U. Required for Heating Air

The B.T.U. required for heating air. Multiply the cubical contents of the room in question by the factor given in this table, the result being the B.T.U. loss and which must be supplied by the radiators.

External Temp. Deg. Fahr	TEMPERATURE OF AIR IN ROOM									
	40	50	60	70	80	90	100	110	120	130
—40	1 802	2 027	2 252	2 479	2 703	2 928	3 154	3 379	3 604	3 829
—30	1 540	1 760	1 980	2 200	2 420	2 640	2 860	3 080	3 300	3 520
—20	1 290	1 505	1 720	1 935	2 150	2 365	2 580	2 795	3 010	3 225
—10	1 051	1 262	1 473	1 684	1 892	2 102	2 311	2 522	2 732	2 943
0	822	1 028	1 234	1 439	1 645	1 851	2 056	2 262	2 467	2 673
10	604	805	1 007	1 208	1 409	1 611	1 812	2 013	2 215	2 416
20	393	590	787	984	1 181	1 378	1 575	1 771	1 968	2 165
30	192	385	578	770	963	1 155	1 345	1 540	1 735	1 925
40		188	376	564	752	940	1 128	1 316	1 504	1 692
50			184	367	551	735	918	1 102	1 286	1 470
60				179	359	538	718	897	1 077	1 256
70					175	350	525	700	875	1 049

Wrought Iron Welded Steam, Gas, and Water Pipe

TABLE OF STANDARD DIMENSIONS

Diameter			Thickness	Circumference		Transverse Areas			Length of Pipe per Sq. Ft. of		Length of Pipe Containing One Cu. Ft.	Nominal Weight per Foot	No. of Threads per Inch of Screw	Tap Drill
Nominal Internal	Actual External	Actual Internal		External	Internal	External	Internal	Metal	External Surface	Internal Surface				
Inches	Inches	Inches	Inches	Inches	Inches	Sq. In.	Sq. In.	Sq. In.	Feet	Feet	Feet	Lbs.		
⅛	0.405	0.27	0.068	1.272	0.848	0.129	0.0573	0.0717	9.44	14.15	2513.	0.241	27	11/32
¼	0.54	0.364	0.088	1.696	1.144	0.229	0.1041	0.1249	7.075	10.49	1383.3	0.42	18	7/16
⅜	0.675	0.494	0.091	2.121	1.552	0.358	0.1917	0.1663	5.657	7.73	751.2	0.559	18	9/16
½	0.84	0.623	0.109	2.639	1.957	0.554	0.3048	0.2492	4.547	6.13	472.4	0.837	14	11/16
¾	1.05	0.824	0.113	3.299	2.589	0.866	0.5333	0.3327	3.637	4.635	270.	1.115	14	15/16
1	1.315	1.048	0.134	4.131	3.292	1.358	0.8626	0.4954	2.904	3.645	166.9	1.668	11½	1 3/16
1¼	1.66	1.38	0.14	5.215	4.335	2.164	1.496	0.668	2.301	2.768	96.25	2.244	11½	1½
1½	1.9	1.611	0.145	5.969	5.061	2.835	2.038	0.797	2.01	2.371	70.66	2.678	11½	1¾
2	2.375	2.067	0.154	7.461	6.494	4.43	3.356	1.074	1.608	1.848	42.91	3.609	11½	2¼
2½	2.875	2.468	0.204	9.032	7.753	6.492	4.784	1.708	1.328	1.547	30.1	5.739	8	2 11/16
3	3.5	3.067	0.217	10.996	9.636	9.621	7.388	2.243	1.091	1.245	19.5	7.536	8	3 5/16
3½	4.	3.548	0.226	12.566	11.146	12.566	9.887	2.679	0.955	1.077	14.57	9.001	8	3 13/16
4	4.5	4.026	0.237	14.137	12.648	15.904	12.73	3.174	0.849	0.949	11.31	10.665	8	4 5/16
4½	5.	4.508	0.246	15.708	14.162	19.635	15.961	3.674	0.764	0.848	9.02	12.34	8	...
5	5.563	5.045	0.259	17.477	15.849	24.306	19.99	4.316	0.687	0.757	7.2	14.502	8	...
6	6.625	6.065	0.28	20.813	19.054	34.472	28.888	5.584	0.577	0.63	4.98	18.762	8	...
7	7.625	7.023	0.301	23.955	22.063	45.664	38.738	6.926	0.501	0.544	3.72	23.271	8	...
8	8.625	7.982	0.322	27.096	25.076	58.426	50.04	8.386	0.443	0.478	2.88	28.177	8	...
9	9.625	8.937	0.344	30.238	28.076	72.76	62.73	10.03	0.397	0.427	2.29	33.701	8	...
10	10.75	10.019	0.366	33.772	31.477	90.763	78.839	11.924	0.355	0.382	1.82	40.065	8	...

SQUARE FEET OF SURFACE PER LINEAL FOOT OF PIPE

ON ALL LENGTHS OVER 1 FT.; FRACTIONS LESS THAN TENTHS ARE ADDED TO OR DROPPED

SIZE OF PIPE

Length of Pipe	¾	1	1¼	1½	2	2½	3	4	5	6	7	8
1	.275	.346	.434	.494	.622	.753	.916	1.175	1.455	1.739	1.996	2.257
2	.5	.7	.9	1.	1.2	1.5	1.8	2.4	2.9	3.5	4.	4.5
3	.8	1.	1.3	1.5	1.9	2.3	2.7	3.5	4.4	5.2	6.	6.8
4	1.1	1.4	1.7	2.	2.5	3.	3.6	4.7	5.8	7.	8.	9.
5	1.4	1.7	2.2	2.4	3.1	3.8	4.6	5.8	7.3	7.7	10.	11.3
6	1.6	2.1	2.6	2.9	3.7	4.5	5.5	7.	8.7	10.5	12.	13.5
7	1.9	2.4	3.	3.4	4.4	5.3	6.4	8.2	10.2	12.1	14.	15.8
8	2.2	2.8	3.5	3.9	5.	6.	7.3	9.4	11.6	13.9	16.	18.
9	2.5	3.1	3.9	4.4	5.6	6.8	8.2	10.6	13.1	15.7	18.	20.3
10	2.7	3.5	4.3	4.9	6.2	7.5	9.1	11.8	14.6	17.4	20.	22.6
11	3.	3.8	4.8	5.4	6.8	8.3	10.	12.9	16.	19.1	22.	24.9
12	3.3	4.1	5.2	5.9	7.5	9.	11.	14.1	17.4	20.9	24.	27.1
13	3.6	4.5	5.6	6.4	8.1	9.8	11.9	15.3	18.9	22.6	26.	29.4
14	3.8	4.8	6.1	6.9	8.7	10.5	12.8	16.5	20.3	24.3	28.	31.6
15	4.1	5.2	6.5	7.4	9.3	11.3	13.7	17.6	21.8	26.1	30.	33.9
16	4.4	5.5	6.9	7.9	10.	12.	14.6	18.8	23.2	27.8	32.	36.1
17	4.7	5.9	7.4	8.4	10.6	12.8	15.5	20.	24.7	29.5	34.	38.4
18	5.	6.2	7.8	8.9	11.2	13.5	16.5	21.2	26.2	31.3	36.	40.6
19	5.2	6.6	8.3	9.4	11.8	14.3	17.4	22.3	27.6	33.1	38.	42,9
20	5.5	6.9	8.7	9.9	12.5	15.	18.3	23.5	29.1	34.8	40.	45.2
21	5.8	7.3	9.1	10.4	13.	15.8	19.2	24.7	30.5	36.5	42.	47.4
22	6.	7.6	9.6	10.9	13.7	16.5	20.2	25.9	32.	38.3	44.	49.7
23	6.3	8.	10.	11.3	14.3	17.3	21.1	27.	33.5	40.	46.	52.
24	6.6	8.3	10.4	11.9	14.9	18.	22.	28.2	34.9	41.7	48.	54.2
25	6.9	8.6	10.9	12.3	15.6	18.8	22.9	29.3	36.3	43.5	50.	56.4
26	7.1	9.	11.3	12.8	16.2	19.5	23.8	30.5	37.8	45.2	52.	58.6
27	7.4	9.4	11.7	13.3	16.8	20.3	24.7	31.7	39.3	47.	54.	61.
28	7.7	9.7	12.2	13.8	17.4	21.	25.6	32.9	40.7	48.7	56.	63.2
29	8.	10.	12.6	14.3	18.	21.8	26.6	34.1	42.2	50.4	58.	65.5
30	8.3	10.4	13.	14.8	18.7	22.5	27.5	35.3	43.6	52.1	60.	67.7
31	8.5	10.7	13.5	15.3	19.3	23.3	28.4	36.4	45.1	53.9	62.	70.
32	8.8	11.1	13.9	15.8	19.9	24.1	29.3	37.6	46.5	55.6	64.	72.2
33	9.1	11.4	14.3	16.3	20.5	24.8	30.2	38.8	48.	57.4	66.	74.4
34	9.4	11.7	14.7	16.8	21.2	25.6	31.1	40.	49.5	59.1	68.	76.7
35	9.6	12.1	15.2	17.3	21.8	26.3	32.	41.1	50.9	60.8	70.	79.
36	9.9	12.5	15.6	17.8	22.4	27.	33.	42.3	52.4	62.6	72.	81.3
37	10.2	12.8	16.1	18.3	23.	27.8	33.9	43.5	53.8	64.3	74.	83.5
38	10.5	13.2	16.5	18.8	23.7	28.5	34.8	44.6	55.2	66.	76.	85.8
39	10.7	13.5	16.9	19.3	24.3	29.3	35.7	45.8	56.7	67.8	78.	88.
40	11.	13.8	17.4	19.8	24.9	30.1	36.6	47.	58.2	69.5	80.	90.2
41	11.3	14.2	17.8	20.3	25.5	30.8	37.6	48.2	59.6	71.3	82.	92.5
42	11.5	14.5	18.2	20.8	26.1	31.6	38.5	49.4	61.1	73.	84.	94.8
43	11.8	14.9	18.7	21.3	26.8	32.3	39.4	50.6	62.5	74.8	86.	97.
44	12.1	15.2	19.1	21.8	27.4	33.1	40.3	51.7	64.	76.5	88.	99.3
45	12.4	15.6	19.5	22.2	28.	33.8	41.2	52.9	65.5	78.2	90.	101.6
46	12.7	15.9	20.	22.7	28.6	34.6	42.2	54.	67.	80.	92.	103.8
47	12.9	16.3	20.4	23.2	29.2	35.3	43.	55.2	68.4	81.7	94.	106.
48	13.2	16.6	20.8	23.7	29.9	36.1	43.9	56.4	69.8	83.5	96.	108.4
49	13.5	17.	21.3	24.2	30.5	36.8	44.8	57.6	71.2	85.1	98.	110.5
50	13.8	17.3	21.7	24.7	31.1	37.6	45.8	58.7	72.7	87.	100.	112.8

TABLE SHOWING EXPANSION OF WROUGHT IRON PIPE

Initial	Increase in Length per 100 Ft. when Heated to									
Temperature	160°	180°	200°	212°	228°	240°	250°	259°	267°	274°
Zero, in.	1.28	1.44	1.60	1.69	1.82	1.92	2.00	2.07	2.13	2.20
32° in.	1.02	1.18	1.34	1.43	1.56	1.66	1.74	1.81	1.87	1.94
64° in.	0.77	0.93	1.09	1.18	1.31	1.41	1.49	1.56	1.61	1.69
	Hot Water			Water Boils	5 lb.	10 lb.	15 lb.	20 lb.	25 lb.	30 lb.

Wrought iron pipe expands, in inches, per 100 ft., 4/5 of the increase in temperature of steam or water it is subjected to, over the temperature at the time of installation, divided by 100.

Example—Temperature when installed, 32°, 10 lb. pressure=240°, difference 208°, 4/5 of which equals 1.66 in. expansion per 100 ft.

Heating Surface—Square Feet Standard Cast Iron Direct Radiation

No. of Sect-ions.	Length 2½" per Sect.	SINGLE COLUMN.					TWO COLUMN.					THREE COLUMN.					FOUR COLUMN.					WINDOW.		Length 2½" per Section	No. of Sect-ions.
		38" 3ϕ Sec	32" 2½ϕ Sec	26" 2ϕ Sec	23" 1⅔ϕ Sec	20" 1½ϕ Sec	38" 4ϕ Sec.	32" 3⅓ϕ Sec.	26" 2⅔ϕ Sec	23" 2⅓ϕ Sec	20" 2ϕ Sec	38" 5ϕ Sec	32" 4½ϕ Sec	26" 3¾ϕ Sec	22" 3ϕ Sec.	18" 2¼ϕ Sec	38" 8ϕ Sec	32" 6½ϕ Sec	26" 5ϕ Sec	22" 4ϕ Sec.	18" 3ϕ Sec.	28" 4¾ϕ Sec	24" 4ϕ Sec.		
2	5	6	5	4	3⅓	3	8	6⅔	5⅓	4⅔	4	10	9	7½	6	4½	16	13	10	8	6	9½	8	5	2
3	7½	9	7½	6	5	4½	12	10	8	7	6	15	13½	11¼	9	6¾	24	19½	15	12	9	14¼	12	7½	3
4	10	12	10	8	6⅔	6	16	13⅓	10⅔	9⅓	8	20	18	15	12	9	32	26	20	16	12	19	16	10	4
5	12½	15	12½	10	8⅓	7½	20	16⅔	13⅓	11⅔	10	25	22½	18¾	15	11¼	40	32½	25	20	15	23¾	20	12½	5
6	15	18	15	12	10	9	24	20	16	14	12	30	27	22½	18	13½	48	39	30	24	18	28½	24	15	6
7	17½	21	17½	14	11⅔	10½	28	23⅓	18⅔	16⅓	14	35	31½	26¼	21	15¾	56	45½	35	28	21	33¼	28	17½	7
8	20	24	20	16	13⅓	12	32	26⅔	21⅓	18⅔	16	40	36	30	24	18	64	52	40	32	24	38	32	20	8
9	22½	27	22½	18	15	13½	36	30	24	21	18	45	40½	33¾	27	20¼	72	58½	45	36	27	42¾	36	22½	9
10	25	30	25	20	16⅔	15	40	33⅓	26⅔	23⅓	20	50	45	37½	30	22½	80	65	50	40	30	47½	40	25	10
11	27½	33	27½	22	18⅓	16½	44	36⅔	29⅓	25⅔	22	55	49½	41¼	33	24¾	88	71½	55	44	33	52¼	44	27½	11
12	30	36	30	24	20	18	48	40	32	28	24	60	54	45	36	27	96	78	60	48	36	57	48	30	12
13	32½	39	32½	26	21⅔	19½	52	43⅓	34⅔	30⅓	26	65	58½	48¾	39	29¼	104	84½	65	52	39	61¾	52	32½	13
14	35	42	35	28	23⅓	21	56	46⅔	37⅓	32⅔	28	70	63	52½	42	31½	112	91	70	56	42	66½	56	35	14
15	37½	45	37½	30	25	22½	60	50	40	35	30	75	67½	56¼	45	33¾	120	97½	75	60	45	71¼	60	37½	15
16	40	48	40	32	26⅔	24	64	53⅓	42⅔	37⅓	32	80	72	60	48	36	128	104	80	64	48	76	64	40	16
17	42½	51	42½	34	28⅓	25½	68	56⅔	45⅓	39⅔	34	85	76½	63¾	51	38¼	136	110½	85	68	51	80¾	68	42½	17
18	45	54	45	36	30	27	72	60	48	42	36	90	81	67½	54	40½	144	117	90	72	54	85½	72	45	18
19	47½	57	47½	38	31⅔	28½	76	63⅓	50⅔	44⅓	38	95	85½	71¼	57	42¾	152	123½	95	76	57	90¼	76	47½	19
20	50	60	50	40	33⅓	30	80	66⅔	53⅓	46⅔	40	100	90	75	60	45	160	130	100	80	60	95	80	50	20
21	52½	63	52½	42	35	31½	84	70	56	49	42	105	94½	78¾	63	47¼	168	136½	105	84	63				21
22	55	66	55	44	36⅔	33	88	73⅓	58⅔	51⅓	44	110	99	82½	66	49½	176	143	110	88	66				22
23	57½	69	57½	46	38⅓	34½	92	76⅔	61⅓	53⅔	46	115	103½	86¼	69	51¾	184	149½	115	92	69				23
24	60	72	60	48	40	36	96	80	64	56	48	120	108	90	72	54	192	156	120	96	72				24
25	62½	75	62½	50	41⅔	37½	100	83⅓	66⅔	58⅓	50	125	112½	93¾	75	56¼	200	162½	125	100	75				25
26	65	78	65	52	43⅓	39	104	86⅔	69⅓	60⅔	52	130	117	97½	78	58½	208	169	130	104	78				26

PROPERTIES OF SATURATED STEAM

Vacuum in ins. of Mercury or Gage Pres. in lbs.	Absolute Pressure in lbs. per sq. in.	Temperature in Deg. fahr	Total Heat above 32° fahr.		Latent Heat of the Steam in B.t.u.	Volume in cu. ft. of 1 lb. of Steam
			B.t.u. in the Water	B.t.u. in the Steam		
27.88	1.	101.83	69.8	1104.4	1034.6	333.0
25.85	2.	126.15	94.0	1115.0	1021.0	173.5
23.81	3.	141.52	109.4	1121.6	1012.3	118.5
21.78	4.	153.01	120.9	1126.5	1005.7	90.5
19.74	5.	162.28	130.1	1130.5	1000.3	73.33
17.70	6.	170.06	137.9	1133.7	995.8	61.89
15.67	7.	176.85	144.7	1136.5	991.8	53.56
13.63	8.	182.86	150.8	1139.0	988.2	47.27
11.60	9.	188.27	156.2	1141.1	985.0	42.36
9.56	10.	193.22	161.1	1143.1	982.0	38.38
7.52	11.	197.75	165.7	1144.9	979.2	35.10
5.49	12.	201.96	169.9	1146.5	976.6	32.36
3.45	13.	205.87	173.8	1148.0	974.2	30.03
1.42	14.	209.55	177.5	1149.4	971.9	28.02
0.00	14.70	212.00	180.0	1150.4	970.4	26.79
0.3	15.	213.00	181.0	1150.7	969.7	26.27
1.3	16.	216.3	184.4	1152.0	967.6	24.79
2.3	17.	219.4	187.5	1153.1	965.6	23.38
3.3	18.	222.4	190.5	1154.2	963.7	22.16
4.3	19.	225.2	193.4	1155.2	961.8	21.07
5.3	20.	228.0	196.1	1156.2	960.0	20.08
6.3	21.	230.6	198.8	1157.1	958.3	19.18
7.3	22.	233.1	201.3	1158.0	956.7	18.37
8.3	23.	235.5	203.8	1158.8	955.1	17.62
9.3	24.	237.8	206.1	1159.6	953.5	16.93
10.3	25.	240.1	208.4	1160.4	952.0	16.30
15.3	30.	250.3	218.8	1163.9	945.1	13.74
20.3	35.	259.3	227.3	1166.8	938.9	11.89
25.3	40.	267.3	236.1	1169.4	933.3	10.49
31.3	46.	275.8	244.8	1172.0	927.2	9.20
35.3	50.	281.0	250.1	1173.6	923.5	8.51
41.3	56.	288.2	257.5	1175.7	918.2	7.65
45.3	60.	292.7	262.1	1177.0	914.9	7.17
51.3	66.	299.0	268.5	1178.8	910.2	6.56
61.3	76.	308.5	278.3	1181.4	903.0	5.74
71.3	86.	317.1	287.2	1183.6	896.4	5.10
81.3	96.	324.9	295.3	1185.6	890.3	4.60
90.3	105	331.4	302.0	1187.2	885.2	4.23
100.3	115.	338.1	309.0	1188.8	879.8	3.88
125.3	140.	353.1	324.6	1192.2	867.6	3.219
140.3	155.	361.1	332.9	1194.0	861.0	2.920
150.3	165.	366.1	338.2	1195.0	856.8	2.753
165.3	180.	373.1	345.6	1196.4	850.8	2.533
175.3	190.	377.6	350.4	1197.3	846.9	2.406
200.3	215.	388.0	361.4	1199.2	837.9	2.138

Flow of Steam in Pipes

Pressure Drop in Ounces	$87\sqrt{\frac{\text{Drop}}{100}}$	Inside Dia. Pipe Inches	$\sqrt{\frac{D^5}{1+\frac{3.6}{D}}}$	Steam Pressure	$\sqrt{\text{Density}}$	Length Pipe in Inches	$\sqrt{\frac{100}{\text{Length}}}$
1	2.175	1	.522	0	.193	20	2.240
2	3.076	1¼	1.177	.3	.195	40	1.580
3	3.767	1½	1.828	1.3	.201	60	1.290
4	4.350	2	3.709	2.3	.207	80	1.120
5	4.863	2½	6.109	5.3	.223	100	1.000
6	5.328	3	11.183	10.3	.248	120	.912
7	5.754	3½	16.705	15.3	.270	140	.841
8	6.152	4	23.630	20.3	.290	160	.793
10	6.878	4½	32.098	30.3	.326	180	.741
12	7.534	5	43.719	40.3	.358	200	.710
14	8.138	6	69.718	50.3	.388	250	.632
16	8.700	7	105.35	60.3	.415	300	.578
20	9.727	8	150.33	75.3	.452	350	.538
24	10.655	9	205.37	100.3	.507	400	.500
28	11.509	10	271.16	125.3	.557	450	.477
32	12.290	12	437.51	150.3	.603	500	.447
40	13.756	14	733.90	175.3	.645	600	.407
48	15.069	16	925.19	200.3	.648	700	.378
80	19.454					800	.354
160	27.512					900	.333
320	38.863					1000	.316
480	47.652					1400	.267

A×B×C×D = lbs. steam per minute will flow through a pipe for a given condition. Example 4.35×11.183×223×1.00 = 10.84 lbs. per minute—10.84×60 = 650.4 lbs. per hour.

p = Drop in pressure in lbs.
d = inside dia. pipe in inches
L = Length of pipe in feet
D = Density of steam per cu.ft.
W = lbs. of steam per minute

$$W = \sqrt{\frac{PDd^5}{\left(1+\frac{3.6}{d}\right)L}}$$

$$P = .000131\left(1+\frac{3.6}{d}\right)\frac{W^2L}{Dd^5}$$

Chimney Capacities in Horse Power

HORSE POWER $= 3.33(A - 0.6\sqrt{A})\sqrt{H}$

DIAM IN INCHES	AREA-A IN SQ. FT.	EFFECTIVE AREA $E = A - .6\sqrt{A}$ SQ. FT.	HEIGHT OF CHIMNEY IN FEET 50	60	70	80	90	100	110	125	150	175	200	225	250	300	EQUIV. SQ. CHIMNEY SIDE OF SQ $\sqrt{E}+4''$
			COMMERCIAL HORSE POWER OF BOILER														
18	1.77	0.97	23	25	27	29											16
21	2.41	1.47	35	38	41	44											19
24	3.14	2.08	49	54	58	62	66										22
27	3.98	2.78	65	72	78	83	88										24
30	4.91	3.58	84	92	100	107	113	119									27
33	5.94	4.48	115	115	125	133	141	149	156								30
36	7.07	5.47		141	152	163	173	182	191	204							32
39	8.30	6.57			183	196	208	219	229	245	268						35
42	9.62	7.76			216	231	245	258	271	289	316	342					38
48	12.57	10.44				311	330	348	365	389	426	460	492				43
54	15.90	13.51					427	449	472	503	551	595	636	675			48
60	19.64	16.98					536	565	593	632	692	748	800	848	894		54
66	23.76	20.83						694	728	776	849	918	981	1040	1097	1201	59
72	28.27	25.08						835	876	934	1023	1105	1181	1253	1320	1447	64
78	33.18	29.73							1038	1107	1212	1310	1400	1485	1565	1715	70
84	38.48	34.76							1214	1294	1418	1531	1637	1736	1830	2005	75
90	44.18	40.19								1496	1639	1770	1893	2008	2116	2318	80
96	50.27	46.01								1712	1876	2027	2167	2298	2423	2654	86
102	56.75	52.23								1944	2130	2300	2459	2609	2750	3012	91
108	63.62	58.83								2090	2399	2592	2771	2939	3098	3393	96
114	70.88	65.83									2685	2900	3100	3288	3466	3797	101
120	78.54	73.22									2986	3226	3448	3657	3855	4223	107
132	95.03	89.18									3637	3929	4200	4455	4696	5144	117
144	113.10	106.72									4352	4701	5026	5331	5618	6155	128

— PRACTICAL HEIGHTS OF CHIMNEYS —

USING FREE BURNING BITUMINOUS COAL	75 FT	ANTHRACITE PEA COAL	130 FT.
ANTHRACITE OF MEDIUM & LARGE SIZE	100 "	ANTHRACITE BUCKWHEAT	150 "
SLOW BURNING BITUMINOUS COAL	120 "	PLANTS 700 H.P & OVER NOT LESS THAN	150 "

Diameter or Side of Chimney in Inches Required for Varying Amount of Direct Steam Radiating Surface

Height of Chimney in Feet	**20**	**30**	**40**	**50**	**60**	**80**	**100**	**120**
Square Feet of Direct Steam Radiation	**Dimensions Given Are Inside Measurements**							
250	7.4	7.0	6.7	6.4	6.2	6.0	6.0	6.0
500		9.2	8.8	8.2	8.0	6.6	7.3	7.0
750		10.8	10.2	9.6	9.3	8.8	8.5	8.2
1000		12.0	11.4	10.8	10.5	10.0	9.5	9.2
1500		14.4	13.4	12.8	12.4	11.5	11.2	10.8
2000		16.3	15.2	14.5	14.0	13.2	12.6	12.1
3000		18.5	18.2	17.2	16.6	15.8	15.0	14.4
4000		22.2	20.8	19.6	19.0	17.8	17.0	16.3
5000		24.6	23.0	21.6	21.0	19.4	18.6	18.0
6000		26.8	25.0	23.4	22.8	21.2	20.2	19.5
7000		28.8	27.0	25.5	24.4	23.0	21.6	20.8
8000		30.6	28.6	26.8	26.0	24.2	23.4	22.2
9000		32.4	30.4	28.4	27.4	25.6	24.4	23.4
10000		34.0	32.0	30.0	28.6	27.0	25.4	24.6
15000			38.4	36.2	35.0	33.0	31.0	29.2
20000			43.0	42.0	41.0	37.0	35.0	34.0
30000				50.0	48.0	46.0	43.0	41.0

Reduce All Radiation to Direct

Storage of Fuel Per Thousand Pounds

Prepared Stove Size

Hard Coal	18 Cu. Ft.
Soft Coal	20 Cu. Ft.
Coke	34 Cu. Ft.
Cord Wood	38 Cu. Ft.
Oil	18 Cu. Ft.

Factors for Determining Size of Vacuum Pumps as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

STEAM	WATER	STROKE	FACTOR	STEAM	WATER	STROKE	FACTOR
	3	6	4087		6½	12	24180
	3½	6	5564	7	7¼	10	28280
4	4	5	6830		7¼	12	30075
	4	6	7270		8	7	30766
	4	8	8000		8	10	34440
	4½	6	9198	6	8	12	36625
	4½	8	10125		8½	12	41350
	5	5	10720		9	10	43626
	5	6	11355		9	12	48957
	5	8	12500	8	9¼	12	48965
	5	10	13465		10	12	57227
	5	12	14308		10	14	60250
	5½	6	13740	10	12	12	82407
4½	5½	8	15125		10	16	90713
	5½	10	16290		14	16	122935
	5½	12	17315	12	14	20	133000
	6	5	15390		16	16	161270
	6	6	16350	14	16	20	173720
	6	7	17215		18	18	212200
	6	8	18000	16	18	20	219870
5	6	10	19390		18	24	233745
	6	12	20605	18	20	20	271440
	6½	10	22758				

IN THE FOREGOING TABLE THE STEAM CYLINDERS OF THE PUMPS ARE PROPORTIONED FOR ABOUT 100 POUNDS STEAM PRESSURE. PRESSURES DIFFERING MATERIALLY FROM THIS WOULD REQUIRE PROPORTIONALLY DIFFERENT STEAM CYLINDERS.

FORMULA $C = D^2 \times .250 \sqrt[3]{L}$

C = DIRECT RADIATION + 25% + 50 × N.
N = NUMBER OF UNITS (TRAPS).
D = DIAMETER OF WATER CYLINDER.
L = LENGTH OF STROKE IN INCHES.

Pumps

To find the capacity of a pump, per stroke, in gallons.

Rule:—Multiply the area of the cylinder by the length of the stroke and divide by 277.27.

$$\text{Formula} \quad \frac{D^2 \times .7854 \times L}{277.27} = \frac{D^2 \times L}{352.8} \qquad (1)$$

To find the capacity of a pump, per stroke, in pounds.
Rule:—Multiply the area of the cylinder by the length of the stroke and divide by 27.727.

$$\text{Formula} \quad \frac{D^2 \times .7854 \times L}{27.727} = \frac{D^2 \times L}{35.28} \qquad (2)$$

To find the capacity of a pump in gallons, per minute.

Rule:—Multiply (1) by number of strokes per minute.

$$\text{Formula} \quad \frac{D^2 \times L \times N}{352.8} \qquad (3)$$

To find the capacity of a pump in pounds per minute.

Rule:—Multiply (2) by number of strokes per minute.

$$\text{Formula} \quad \frac{D^2 \times L \times N}{35.28} \qquad (4)$$

To find the horse power required to raise water a given height.

Rule:—Multiply the volume in cubic feet per minute, by pressure per square foot and divide by 33000, or weight of water in pounds × height of lift divided by 33000.

$$\text{Formula} = \frac{\text{Vol. in Cu. Ft. per Minute} \times \text{Press per Sq. Ft.}}{33000}$$

$$= \frac{\text{Weight of Water in Pounds} \times \text{Height of Lift}}{33000}$$

Certain allowance should be made for friction, etc., varying from 15 to 25%.

The height of a column of water is equal to pressure per square inch ÷ .433 = pressure per square inch × 2.309.

One Cubic Foot of Water:

Imperial—		United States—	
6.23	Gallons		
1728	Cubic Inches	7½	Gallons
62.4	Pounds		

One Gallon of Water:

Imperial—		United States—	
277.274	Cubic Inches	231	Cubic Inches
10	Pounds	8⅓	Pounds

Boiler Feed Pumps

(Duplex)

Size Inches	Stroke Per Plunger Per Min.	Gallons	Sing to Same Work Inches	S T In.	E X In.	S U In.	D I In.	H.P. Based on Lowest Speed
3 x 2 x 3	100 to 225	8 to 20	2⅞	⅜	½	1¼	1	67
4½x 2¾x 4	100 to 200	20 to 40	4	½	¾	2	1½	150 to 165
5¼x 3½x 5	100 to 200	40 to 80	5	¾	1¼	2½	1½	333
6 x 4 x 6	100 to 150	70 to 100	5⅝	1	1½	3	2	580
7½x 4½x 6	100 to 150	85 to 125	6⅜	1½	2	4	3	700
7½x 5 x 6	100 to 150	100 to 150	7	1½	2	4	3	830
7½x 4½x10	75 to 125	100 to 170	6⅜	1½	2	4	3	830
9 x 5¼x10	75 to 125	135 to 230	7½	2	2½	4	3	1100
10 x 6 x10	75 to 125	180 to 300	8½	2	2½	5	4	1500
10 x 7 x10	75 to 125	245 to 410	9⅞	2	2½	6	5	2000
12 x 7 x10	75 to 125	245 to 410	9⅞	2½	3	6	5	2000
14 x 7 x10	75 to 125	245 to 410	9⅞	2½	3	6	5	2000
12 x 8½x10	75 to 125	365 to 610	12	2½	3	6	5	3000
14 x 8½x10	75 to 125	365 to 610	12	2½	3	6	5	3000
16 x 8½x10	75 to 125	365 to 610	12	2½	3	6	5	3000
18½x 8½x10	75 to 125	365 to 610	12	3	4	6	5	3000
20 x 8½x10	75 to 125	365 to 610	12	4	5	6	5	3000
12 x10¼x10	75 to 125	530 to 890	14¼	2½	3	8	7	4400
14 x10¼x10	75 to 125	530 to 890	14¼	2½	3	8	7	4400
16 x10¼x10	75 to 125	530 to 890	14¼	2½	3	8	7	4400
18½x10¼x10	75 to 125	530 to 890	14¼	3	4	8	7	4400
20 x10¼x10	75 to 125	530 to 890	14¼	4	5	8	7	4400
14 x12 x10	75 to 125	730 to 1220	17	2½	3	10	8	6000
16 x12 x10	75 to 125	730 to 1220	17	2½	3	10	8	6000
18½x12 x10	75 to 125	730 to 1220	17	3	4	10	8	6000
20 x12 x10	75 to 125	730 to 1220	17	4	5	10	8	6000
18½x14 x10	75 to 125	990 to 1660	19¾	3	4	12	10	6000
20 x14 x10	75 to 125	990 to 1660	19¾	4	5	12	10	6000
17 x10 x15	50 to 100	510 to 1020	14	3	....	8	7	8200
20 x12 x15	50 to 100	730 to 1460	17	4	....	12	10	8200
20 x15 x15	50 to 100	1145to2290	21	....	....	....	....	....
25 x15 x15	50 to 100	1145to2290	......	....	....	....	....	....

Pipe Sizing

Capacities of Mains and Risers as Applied to the Bishop-Babcock Air Line System of Steam Circulation

One-Eighth Pound Pressure Loss

Size of Supply Inches	Size of Dry Return Inches	Size of Wet Return Inches	Length of Supply and Return Piping in Feet from Source of Supply to Fartherest Radiator Allowance for Elbows and Valves Must be Added to Measured Distance. Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given for Each Length. Supply Risers Based on Length of Supply Mains. Air Risers ½″ Above First Floor.								
			100	200	300	400	500	750	1000	1250	1500
1	1	1	62	44	36	31	27	22	19	18	16
1¼	1	1	118	83	70	59	52	44	37	35	30
1½	1¼	1	189	133	109	93	84	70	60	55	50
2	1½	1¼	388	280	237	201	182	154	127	117	115
2½	2	1½	657	454	383	322	296	249	208	190	180
3	2½	2	1187	834	657	586	522	435	379	363	340
3½	2½	2	1710	1206	1002	850	775	634	546	503	470
4	3	2½	2450	1720	1440	1220	1100	910	781	717	670
4½	3	2½	3200	2248	1874	1590	1435	1185	1011	942	900
5	3½	3	4175	2947	2460	2087	1882	1052	1330	1235	1000
6	3½	3	6737	4742	3975	3362	2992	2505	2156	1987	1780
7	4	3½	10050	7147	5930	5012	4490	3719	3161	2477	2200
8	4½	4	13950	9860	8205	6962	6230	5149	4262	4027	3800
9	5	4½	19200	13780	11165	9600	8640	6912	5981	5545	4300
10	6	5	25300	18075	14925	12650	11385	9400	7962	7425	7000
12	7	6	40800	28400	23675	20150	18100	14925	12540	11750	10000
14	8	7	59750	42200	33300	28800	25600	20700	18100	16500	15000
15	8	7	70200	49400	40000	34000	30500	24900	21400	19400	17900
16	9	8	83700	59700	49200	42500	37900	29900	26600	24000	21800

Pipe Sizing

Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation

Size of Supply Inches	Size of Return Inches	Length of Supply and Return Piping in Feet from Source of Supply to Farthest Radiator. Allowance for Elbows and Valves Must be Added to Measured Distance. Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given for Each Length. Supply Risers Based on Length of Supply, Return Riser ¾″ up to 200°, 1″ to 400°, 1¼″ to 800°.								
		100	200	300	400	500	750	1000	1250	1500
1	1	87	64	50	44	38	30	27	25	20
1¼	1	161	114	94	81	71	59	51	45	42
1½	1	267	189	149	129	118	97	84	76	70
2	1¼	589	436	363	314	285	242	203	179	169
2½	1¼	1026	702	583	502	465	388	330	290	266
3	1½	1862	1308	1023	910	816	671	606	580	483
3½	1½	2662	1905	1524	1316	1212	968	871	740	702
4	2	3725	2630	2152	1848	1669	1383	1212	1066	992
4½	2	4993	3512	2866	2468	2230	1814	1598	1450	1330
5	2½	6620	4698	3845	3305	2992	2420	2152	1936	1766
6	3	10658	7527	6033	5304	4692	3896	3486	3100	2810
7	3½	15500	11150	9029	7713	6883	5616	4936	4550	4040
8	4	21783	15500	12433	10850	9680	7850	6583	6100	5813
9	4½	29066	21800	16466	14533	13083	10333	9100	8133	7550
10	5	38733	28100	22550	19366	17433	14116	12316	11150	10166
12	6	61900	43600	35542	30772	27533	22266	19116	17516	16266
14	7	82333	58133	45900	39700	35316	28550	24966	22750	20700
15	7	96806	68133	55166	47283	42083	36016	29516	26783	24683
16	8	115333	82325	67825	58583	52266	41733	36683	33100	30033

Pipe Sizing

Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

• ONE QUARTER POUND PRESSURE LOSS •

SIZE OF SUPPLY	LENGTH OF SUPPLY AND RETURN PIPING IN FEET FROM SOURCE OF SUPPLY TO FARTHEST RADIATOR. ALLOWANCE FOR ELBOWS AND VALVES MUST BE ADDED TO MEASURED DISTANCE PIPE CAPACITIES IN SQUARE FEET OF DIRECT CAST IRON RADIATION GIVEN FOR EACH LENGTH. SUPPLY RISERS BASED ON LENGTH OF SUPPLY: RETURN RISER ¾ UP TO 800#, 1" TO 1500#, 1¼" TO 2400#								
INCHES	200	300	400	500	750	1000	1250	1500	2000
1	66	52	46	40	31	29	26		
1¼	118	97	84	75	61	53	47	43	38
1½	195	154	133	123	101	87	79	72	62
2	450	375	325	295	250	210	185	175	150
2½	725	600	525	480	400	340	300	275	245
3	1350	1100	940	850	700	625	600	500	430
3½	1950	1575	1360	1250	1000	900	800	725	625
4	2725	2225	1910	1725	1400	1250	1100	1025	875
4½	3625	2960	2550	2300	1875	1650	1500	1375	1175
5	4850	3975	3410	3090	2500	2225	2000	1825	1600
6	7775	6400	5475	4850	4025	3600	3200	2900	2540
7	11500	9325	7960	7100	5800	5100	4700	4175	3660
8	16000	13000	11200	10000	8100	6800	6300	6000	5100
9	22000	17000	15000	13500	11000	9400	8400	7800	6850
10	29000	23300	20000	18000	14600	12700	11500	10500	9120
12	45000	36750	31810	28400	23000	19700	18100	16800	16200
14	60000	47400	41000	36500	29500	25800	23500	21400	18600
15	70000	57000	49100	43500	35500	30500	27700	25500	22000
16	85000	70000	60500	54000	43600	37900	34200	31000	27000

Pipe Sizing

Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

· Half Pound Pressure Loss ·

Length of Supply and Return Piping in Feet from Source of Supply to Farthest Radiator.
Allowance for Elbows and Valves Must Be Added to Measured Distance
Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given for Each Length.
Supply Risers Based on Length of Supply: Return Riser 3/4" up to 800#, 1" to 1500#, 1 1/4" to 2400#

Size of Supply ·Inches	200	300	400	500	750	1000	1250	1500	2000
1	92	72	64	56	44	40	36		
1¼	166	136	118	100	86	74	66	60	
1½	274	216	188	172	142	122	110	102	
2	632	528	456	414	350	294	260	246	
2½	1020	850	720	676	564	480	420	386	
3	1900	1420	1320	1174	964	880	840	700	
3½	2740	2200	1910	1760	1404	1264	1120	1020	
4	3800	3120	2680	2420	1970	1760	1550	1440	
4½	5100	4160	3580	3240	2630	2320	2100	1930	
5	6820	5580	4800	4340	3510	3120	2810	2560	
6	10920	9000	7700	6800	5650	5060	4500	4080	
7	16200	13100	11200	10000	8150	7160	6600	5860	
8	22500	18300	15700	14040	11400	9550	8850	8440	
9	30900	23900	21100	19000	14500	13200	11800	10950	
10	40800	32700	28100	25300	20500	17900	16200	14750	
12	63200	51500	44600	40000	32300	27800	25400	23600	
14	84400	66600	57600	51200	41400	36200	33000	30000	
15	98800	80000	68200	61000	49800	42800	38800	35800	
16	119500	98500	85000	75800	59800	53200	48000	43600	

Pipe Sizing

Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

· THREE QUARTER POUND PRESSURE LOSS ·

SIZE OF SUPPLY	LENGTH OF SUPPLY AND RETURN PIPING IN FEET FROM SOURCE OF SUPPLY TO FARTHEST RADIATOR. ALLOWANCE FOR ELBOWS AND VALVES MUST BE ADDED TO MEASURED DISTANCE. PIPE CAPACITIES IN SQUARE FEET OF DIRECT CAST IRON RADIATION GIVEN FOR EACH LENGTH. SUPPLY RISERS BASED ON LENGTH OF SUPPLY & RETURN RISER ¾ UP TO 800′, 1" TO 1500′, 1¼" TO 2400′								
INCHES	200	300	400	500	750	1000	1250	1500	2000
1	101	83	75	67	52	50	46	40	35
1¼	184	156	138	123	105	92	83	76	70
1½	305	251	221	204	173	152	139	128	120
2	690	593	522	476	409	354	320	298	280
2½	1156	1012	880	814	693	605	546	500	485
3	2083	1720	1543	1398	1179	1069	1020	876	830
3½	3046	2565	2273	2093	1731	1573	1430	1302	1240
4	4299	3648	3206	2915	2440	2203	1993	1839	1745
4½	5670	4846	4313	3908	3268	2943	2726	2493	2350
5	7660	6533	5766	5255	4400	3986	3670	3328	3200
6	12383	10612	9380	8395	7143	6453	5873	5113	4780
7	18376	15592	13746	12426	10146	9392	8763	7876	7300
8	25726	21910	19449	17563	14721	12772	11926	11187	10500
9	35023	28815	26006	23678	19659	17599	16130	14843	14000
10	46283	39085	34653	31558	26573	23715	21913	20030	19000
12	72356	61925	55293	50202	42292	37447	34893	32256	32000
14	102200	80700	75300	68372	57935	52048	48436	44280	42000
15	119800	97000	85200	74000	60400	58775	53318	48540	44000
16	144750	119250	103000	91900	73500	64500	58200	52800	48000

Pipe Sizing

Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

•ONE POUND PRESSURE LOSS•

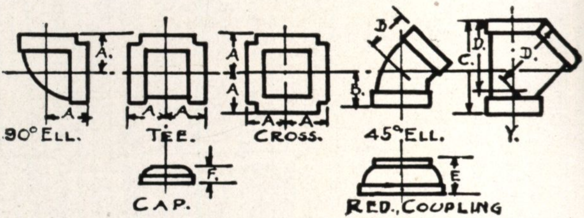
SIZE OF SUPPLY INCHES	LENGTH OF SUPPLY AND RETURN PIPING IN FEET FROM SOURCE OF SUPPLY TO FARTHEST RADIATOR. ALLOWANCE FOR ELBOWS AND VALVES MUST BE ADDED TO MEASURED DISTANCE PIPE CAPACITIES IN SQUARE FEET OF DIRECT CAST IRON RADIATION GIVEN FOR EACH LENGTH. SUPPLY RISERS BASED ON LENGTH OF SUPPLY÷RETURN RISER ¾" UP TO 800#, 1" TO 1500#, 1¼" TO 2400#								
	200	300	400	500	750	1000	1250	1500	2000
1	132	104	92	80	62	58	52		
1¼	236	194	168	150	122	106	94	86	76
1½	390	308	266	246	202	174	158	144	124
2	900	750	650	590	500	420	370	350	300
2½	1450	1200	1050	960	800	680	600	550	490
3	2700	2200	1880	1700	1400	1250	1200	1000	860
3½	3900	3150	2720	2500	2000	1800	1600	1450	1250
4	5450	4450	3820	3450	2800	2500	2200	2050	1750
4½	7250	5920	5100	4600	3750	3300	3000	2750	2350
5	9700	7950	6820	6180	5000	4450	4000	3650	3200
6	15550	12800	10950	9700	8050	7200	6400	5800	5080
7	23000	18650	15920	14200	11600	10200	9400	8350	7320
8	32000	26000	22400	20000	16200	13600	12600	12000	10200
9	44000	34000	30000	27000	22000	18800	16800	15600	13700
10	58000	46600	40000	36000	29200	25400	23000	21000	18240
12	90000	73500	63600	56800	46000	39400	36200	33600	32400
14	120000	94800	82000	73000	59000	51600	47000	42800	37200
15	140000	114000	98200	87000	71000	61000	55400	51000	44000
16	170000	140000	121000	108000	87200	75800	68400	62000	54400

Pipe Sizing

Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

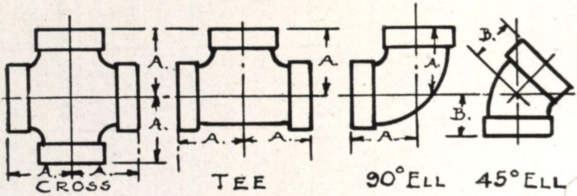
Size of Return	Length of Return Piping in Feet from Suction of Pump to Farthest Radiator. Allowance for Elbows and Lifts Must be Added to Measured Distance. Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given for Each Length Based on One Third of a Pound of Condensation per Square Foot per Hour.											
	100	200	300	400	500	600	700	800	900	1000	1250	1500
1	1500	1450	1400	1200								
1¼	3200	3150	3100	2500	2500							
1½	5000	4500	4000	3500	3250	3000	2900	2800				
2	8000	7000	6250	5775	5000	4850	4500	4250	4100	4000		
2½	11[illegible]00	10500	9500	9000	8000	7250	6950	6250	6000	5000	4900	4500
3	19000	18000	16500	15000	14000	13000	12000	11500	10900	10500	9750	8500
3½	28000	26000	24500	23000	22000	20700	19900	18000	17500	17000	16600	15000
4	40000	38000	36000	34500	32700	31200	30000	28700	28000	27000	25200	24500
4½	54500	51700	49500	47000	45000	43500	41700	40000	39000	37500	35000	33750
5	71000	67500	64000	61000	58000	55000	52700	50700	49000	47500	44000	41700
6	91000	87000	83000	80000	76500	73500	71000	68500	66500	64500	60500	57700
7	115500	111500	108000	104000	101500	97700	94500	92000	90000	87000	82000	78500
8	146000	141500	137000	133000	129500	126000	122500	119500	116500	114000	107500	102000

General Dimensions of Standard Cast Iron Screwed Fittings



Size Inches	"A" Inches	"B" Inches	"C" Inches	"D" Inches	"E" Inches	"F" Inches
1/4	13/16	3/4	....	....	....	..
3/8	15/16	13/16	....	....	....	....
1/2	1 1/8	7/8	2 1/2	1 7/8	....	....
3/4	1 5/16	1	3	2 1/4	.. .	....
1	1 7/16	1 1/8	3 1/2	2 3/4	....	....
1 1/4	1 3/4	1 5/16	4 1/4	3 1/4	....	....
1 1/2	1 15/16	1 7/16	4 7/8	3 13/16	....	....
2	2 1/4	1 11/16	5 3/4	4 1/2	....	....
2 1/2	2 11/16	1 15/16	6 1/4	5 3/16	....	....
3	3 1/8	2 3/16	7 7/8	6 1/8	2 15/16	....
3 1/2	3 7/16	2 3/8	8 7/8	6 7/8	3 1/8	....
4	3 3/4	2 5/8	9 3/4	7 5/8	3 3/8	2 1/16
4 1/2	4 1/16	2 13/16	11 5/8	9 1/4	3 5/8	2 3/16
5	4 7/16	3 1/16	12 5/8	9 1/4	3 7/8	2 3/8
6	5 1/8	3 7/16	13 7/16	10 3/4	4 3/8	2 5/8
7	5 13/16	3 7/8	15 1/4	12 1/4	4 13/16	2 7/8
8	6 1/2	4 1/4	16 15/16	13 5/16	5 1/4	3 1/8
9	7 3/16	4 11/16	20 11/16	16 3/4	5 11/16	3 3/8
10	7 7/8	5 3/16	20 11/16	16 3/4	6 3/16	3 5/8
12	9 1/4	6	24 1/8	19 5/8	7 1/8	4 1/4

General Dimensions of Extra Heavy Cast Iron Screwed Fittings



Size, Inches	"A" Inches	"B" Inches
1	2	1 3/8
1 1/4	2 1/4	1 1/2
1 1/2	2 9/16	1 5/8
2	3	1 15/16
2 1/2	3 1/2	2 1/4
3	4 1/8	2 1/2
3 1/2	4 11/16	2 9/16
4	5 1/8	2 3/4

Extra Heavy Flanges

All dimensions in inches

Size of Pipe	Diameter of Flange	Thickness of Flange	Diameter of Bolt Circle	Number of Bolts	Size of Bolts
1	4½	11/16	3¼	4	½
1¼	5	¾	3¾	4	½
1½	6	13/16	4½	4	⅝
2	6½	⅞	5	4	⅝
2½	7½	1	5⅞	4	¾
3	8¼	1⅛	6⅝	8	¾
3½	9	1 3/16	7¼	8	¾
4	10	1¼	7⅞	8	¾
4½	10½	1 5/16	8½	8	¾
5	11	1⅜	9¼	8	¾
6	12½	1 7/16	10⅝	12	¾
7	14	1½	11⅞	12	⅞
8	15	1⅝	13	12	⅞
9	16¼	1¾	14	12	1
10	17½	1⅞	15¼	16	1
12	20½	2	17¾	16	1⅛
14 O. D.	23	2⅛	20¼	20	1⅛
15 O. D.	24½	2 3/16	21½	20	1¼
16 O. D.	25½	2¼	22½	20	1¼
18 O. D.	28	2⅜	24¾	24	1¼
20 O. D.	30½	2½	27	24	1⅜
22 O. D.	33	2⅝	29¼	24	1½
24 O. D.	36	2¾	32	24	1⅝

Dimensions of Standard Flanges

Size of Pipe Inches	Diameter of Flange Inches	Thickness of Flange Inches	Diameter of Bolt Circle Inches	No. of Bolt Holes	Diameter of Bolt Holes Inches
2	6	⅝	4¾	4	¾
2½	7	11/16	5½	4	¾
3	7½	¾	6	4	¾
3½	8½	13/16	7	4	¾
4	9	15/16	7½	8	¾
4½	9¼	15/16	7¾	8	⅞
5	10	15/16	8½	8	⅞
6	11	1	9½	8	⅞
7	12½	1 1/16	10¾	8	⅞
8	13½	1⅛	11¾	8	⅞
9	15	1⅛	13¼	12	⅞
10	16	1 3/16	14¼	12	1
12	19	1¼	17	12	1
14	21	1⅜	18¾	12	1⅛
16	23½	1 7/16	21¼	16	1⅛

Measurements of Rooms

Square Feet of Wall Surface

Running Feet of Wall	CEILING HEIGHTS—Feet											
	8	8½	9	9½	10	10½	11	11½	12	13	14	15
6	48	51	54	57	60	63	66	69	72	78	84	90
6½	52	55	59	62	65	68	72	75	78	85	91	98
7	56	60	63	67	70	74	77	81	84	91	98	105
7½	60	64	68	72	75	79	83	86	90	98	105	113
8	64	68	72	76	80	84	88	92	96	104	112	120
8½	68	72	77	81	85	89	94	98	102	111	119	128
9	72	76	81	86	90	94	99	104	108	117	126	135
9½	76	81	86	90	95	100	105	109	114	124	133	143
10	80	85	90	95	100	105	110	115	120	130	140	150
10½	84	89	95	100	105	110	116	121	126	137	147	158
11	88	94	99	105	110	116	121	127	132	143	154	165
11½	92	98	104	109	115	121	127	132	138	150	161	173
12	96	102	108	114	120	126	132	138	144	156	168	180
12½	100	106	113	119	125	131	138	144	150	163	175	188
13	104	111	117	123	130	137	143	150	156	169	182	195
13½	108	115	122	129	135	142	149	155	162	176	189	203
14	112	119	126	133	140	147	154	161	168	182	196	210
14½	116	123	131	138	145	152	160	167	174	189	203	218
15	120	128	135	143	150	158	165	173	180	195	210	225
15½	124	132	140	147	155	163	171	178	186	202	217	233
16	128	136	144	152	160	168	176	184	192	208	224	240
16½	132	140	149	157	165	173	182	190	198	215	231	248
17	136	145	153	162	170	179	187	196	204	221	238	255
17½	140	149	158	166	175	184	193	201	210	228	245	263
18	144	153	162	171	180	189	198	207	216	234	252	270
19	152	162	171	181	190	200	209	219	228	247	266	285
20	160	170	180	190	200	210	220	230	240	260	280	300
21	168	179	189	200	210	221	231	242	252	273	294	315
22	176	187	198	209	220	231	242	253	264	286	308	330
23	184	196	207	218	230	242	253	264	276	299	322	345
24	192	204	216	228	240	252	264	276	288	312	336	360
25	200	213	225	238	250	263	275	288	300	325	350	375
26	208	221	234	247	260	273	286	299	312	338	364	390
27	216	230	243	257	270	284	297	311	324	351	378	405
28	224	238	252	266	280	294	308	322	336	364	392	420
29	232	247	261	276	290	305	319	334	348	377	406	435
30	240	255	270	285	300	315	330	345	360	390	420	450
31	248	264	279	295	310	326	341	357	372	403	434	465
32	256	272	288	304	320	336	352	368	384	416	448	480

In order to simplify calculations of the sort listed in the above table and those following, dimensions of under 3 inches have been omitted, that is, 9 inches should be extended to next even foot, and 3 inches over a foot dropped to the nearest even foot. Where, for example, a room is 9′ 2″ by 12′ 10″ with an 8′ 10″ ceiling, such a room may be considered a 9—13—9 room.

Measurements of Rooms

Full Area of Two-Pane Windows

Giving the Total Area of Two-Pane Windows, including the Sash

Width Glass	Width of Open'g	Height Glass	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"	50"	52"	54"
In.	Ft. In.	Height Open'g	3'-6"	3'-10"	4'-2"	4'-6"	4'-10"	5'-2"	5'-6"	5'-10"	6'-2"	6'-6"	6'-10"	7'-2"	7'-6"	7'-10"	8'-2"	8'-6"	8'-10"	9'-2"	9'-6"
16	1- 8	Standard Sizes of Two-Light Windows	5.8	6.4	7.0	7.5	8.0	8.6	9.2	9.7	10.3	10.8	11.4	11.9	12.5	13.0	13.6	14.2	14.7	15.2	15.8
18	1-10		6.4	7.0	7.6	8.2	8.9	9.5	10.1	10.7	11.3	11.9	12.5	13.1	13.7	14.3	15.0	15.6	16.2	16.8	17.4
20	2- 0		7.0	7.7	8.3	9.0	9.7	10.3	11.0	11.7	12.3	13.0	13.6	14.3	15.0	15.6	16.3	17.0	17.7	18.3	19.0
22	2- 2		7.6	8.3	9.0	9.7	10.5	11.2	11.9	12.6	13.4	14.0	14.7	15.5	16.2	17.0	17.7	18.4	19.2	19.8	20.6
24	2- 4		8.2	8.9	9.7	10.5	11.3	12.0	12.8	13.6	14.4	15.1	15.9	16.7	17.4	18.2	19.0	19.8	20.6	21.4	22.2
26	2- 6		8.7	9.6	10.4	11.2	12.0	12.8	13.7	14.6	15.4	16.2	17.1	17.9	18.7	19.5	20.4	21.2	22.0	23.0	23.8
28	2- 8		9.3	10.2	11.1	12.0	12.9	13.8	14.7	15.5	16.4	17.3	18.2	19.1	20.0	20.8	21.8	22.6	23.5	24.4	25.3
30	2-10		10.0	10.8	11.8	12.8	13.7	14.6	15.6	16.5	17.5	18.4	19.3	20.3	21.2	22.2	23.2	24.0	25.0	26.0	27.0
32	3- 0		10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5	21.5	22.5	23.5	24.5	25.5	26.5	27.5	28.5
34	3- 2		11.0	12.1	13.2	14.3	15.3	16.4	17.4	18.5	19.5	20.6	21.6	22.6	23.7	24.8	25.8	27.0	28.0	29.0	30.0
36	3- 4		11.7	12.8	13.9	15.0	16.1	17.2	18.3	19.5	20.5	21.6	22.8	23.8	25.0	26.1	27.2	28.3	29.4	30.5	31.7
38	3- 6		12.2	13.4	14.6	15.8	16.9	18.0	19.2	20.4	21.6	22.7	24.0	25.0	26.2	27.4	28.6	29.8	31.0	32.1	33.2
40	3- 8		12.8	14.0	15.3	16.5	17.7	18.9	20.1	21.4	22.6	23.8	25.1	26.2	27.4	28.7	30.0	31.2	32.4	33.6	34.9
42	3-10		13.4	14.7	16.0	17.3	18.5	19.8	21.0	22.4	23.6	24.9	26.2	27.4	28.6	30.0	31.3	32.6	33.8	35.0	36.4
44	4- 0		14.0	15.3	16.7	18.0	19.3	20.7	22.0	23.4	24.6	26.0	27.3	28.6	30.0	31.3	32.6	34.0	35.3	36.5	38.0
46	4- 2		14.6	16.0	17.4	18.8	20.1	21.5	23.0	24.4	25.6	27.1	28.4	29.8	31.2	32.6	34.0	35.5	36.8	38.2	39.6
48	4- 4		15.2	16.6	18.0	19.5	20.9	22.4	23.8	25.3	26.7	28.1	29.5	31.0	32.4	34.0	35.4	36.8	38.3	39.6	41.0
50	4- 6		15.7	17.2	18.7	20.3	21.8	23.2	24.8	26.2	27.7	29.2	30.7	32.2	33.7	35.2	36.7	38.2	39.7	41.2	42.6
52	4- 8		16.3	17.9	19.4	21.0	22.5	24.0	25.6	27.2	28.7	30.3	31.8	33.4	35.0	36.5	38.0	39.6	41.2	42.7	44.2
54	4-10		16.9	18.5	20.1	21.8	23.4	25.0	26.6	28.2	29.8	31.4	32.9	34.6	36.2	37.8	39.5	41.0	42.7	44.3	46.0
56	5- 0		17.5	19.3	20.8	22.5	24.2	25.8	27.5	29.0	30.8	32.5	34.0	35.8	37.5	39.8	40.8	42.5	44.2	46.0	47.5

Standard Data

Diameter × 3.1416 = Circumference
Circumference × .3183 = Diameter
Diameter^2 × .7854 = Area of circle
Area of Circle × 1.2732 = Area of circumscribed square
Area of Circle × .63662 = Area of inscribed square
Dia. of circle × .88623 = Side of equal square
Dia. of circle × .7071 = Side of inscribed square
Circumference of circle × 1.1284 = Perimeter of equal square
Side of square × 1.4142 = Dia. of circumscribed circle
Side of square × 1.1284 = Dia. of equal circle
Perimeter of square × .88623 = Circumference of equal circle
Diameter^2 × 3.1416 = Surface of sphere
Diameter^3 × .5236 = Volume of sphere
Dia. of sphere × .806 = Dimensions of equal cube
Dia. of sphere × .6667 = Length of equal cylinder
Area of base × ⅓ height = Volume of pyramid or cone
Base × ½ height = Area of triangle
Radius × 1.1547 = Side of inscribed cube
Sq. ins. × 1.2732 = Circular inches
Sq. ins. × .00695 = Sq. ft.
Sq. ft. × .111 = Sq. yd.
Sq. yds. × .0002066 = Acres
Cu. in. × .00058 = Cu. ft.
Cu. ft. × .03704 = Cu. yd.
Cu. in. × .004329 = U. S. gal.
Cu. ft. × 7.4805 = U. S. gal.
Cu. in. × .000466 = U. S. bu.
Cu. ft. × .8036 = U. S. bu.
U. S. bu. × 2150.42 = Cu. in.
U. S. bu. × 1.242 = Cu. ft.
U. S. bu. × .046 = Cu. yd.
U. S. gal. × 231. = Cu. in.
U. S. gal. × .13368 = Cu. ft.
Cu. in. water × .36127 = Pounds (avoirdupois)
Cu. ft. water × 62.4283 = Pounds (avoirdupois)
U. S. gals. water ÷ 268.8 = Tons
Column of water 1" dia. x 12" high = .34 lb. (avoirdupois)
Cu. in. × .263 = Lb. Av. Cast Iron
Cu. in. × .281 = Lb. Av. Wrought Iron
Cu. in. × .283 = Lb. Av. Cast Steel
Cu. in. × .3225 = Lb. Av. Copper
Cu. in. × .3037 = Lb. Av. Brass
Cu. in. × .26 = Lb. Av. Zinc
Cu. in. × .4103 = Lb. Av. Lead
Cu. in. × .2636 = Lb. Av. Tin
Cu. in. × .4908 = Lb. Av. Mercury
12 × weight of pine pattern = Iron casting
13 × weight of pine pattern = Brass casting
14 × weight of pine pattern = Lead casting

Standard Data

1 Calorie = 3.968 B. t. u.
1 B. t. u. = 0.252 Calorie
1 lb. per sq. in. = 703.08 kilogrammes per m^2
1 Kilogramme per m^2 = 0.00142 lbs. per sq. in.
1 Calorie per m^2 = 0.3687 B. t. u. per sq. ft.
1 B. t. u. per sq. ft. = 2.712 calories per m^2
1 Calorie per m^2 per deg difference cent. = 0.2048 B. t. u. per sq. ft. per deg. difference fahr.
1 B. t. u. per sq. ft. per deg. difference fahr. = 4.882 Calories per m^2 per deg. difference cent.
1 B. t. u. per lb. = 0.556 Calories per kilog.
1 Calorie per kilog. = 1.8 B. t. u. per lb.
1 Litre of Coke at 26.3 lb. per cu. ft. = 0.93 lbs.
1 lb. of Coke at 26.3 lb. per cu. ft. = 1.076 litres.
Water expands in bulk from 40 deg. to 212 deg. = One twenty-third.

A cubic inch of water evaporated under ordinary atmospheric pressure is converted into 1 cubic foot of steam (approximately).

WEIGHTS

1 cu. in. of Cast Iron	weighs	0.260 lb.
1 cu. in. of Wrought Iron	weighs	0.280 lb.
1 cu. in. of Water	weighs	0.036 lb.
1 U. S. gal.	weighs	8.330 lb.
1 Imperial gal.	weighs	10. lb.
1 U. S. gal.	equals	231. cu. in.
1 Imperial gal.	equals	277.274 cu. in.
1 cu. ft. of Water	equals	7.480 U. S. gal.
1 lb. of Steam	equals	27.222 cu. ft.
1 lb. of Air.	equals	13.817 cu. ft.

WEIGHTS AND MEASURES

SURVEYORS MEASURE

7.92 in. … 1 link
25 links … 1 rod
4 rods … 1 chain
10 sq. chains or 160 sq. rods … 1 acre
640 acres … 1 sq. mile
36 sq. miles (6 miles sq.) … 1 township

CUBIC MEASURE

1728 cu. in. … 1 cu. ft.
27 cu. ft. … 1 cu. yd.
128 cu. ft. … 1 cord (wood)
40 c. f. … 1 ton (shpg)
2150.42 cu. in. … 1 standard bu.
231 cu. in. … 1 U. S. standard gal.
1 cu. ft. … about 4/5 of a bu.

METRIC EQUIVALENTS—LINEAR MEASURE

1 centimeter	0.3937 in.	1 in.	2.54 centimeters
1 decimeter	3.937 in.		0.328 ft.
1 ft.			3.048 decimeters
1 meter	39.37 in.		1.0936 yards
1 yd.			0.9144 meter
1 dekameter	1.9884 rods	1 rd.	0.5029 dekameter
1 kilometer	0.62137 m.	1 m.	1.6093 kilometers

Standard Data

METRIC AND ENGLISH MEASURES

MEASURES OF LENGTH

	Metric			English
1	metre	=	39.37	in.
			3.28	ft.
.3048	metre	=	1	ft.
1	centimetre	=	.3937	in.
2.54	centimetres	=	1	in.
1	millimetre	=	.03937	in. (1/25 in., nearly)
25.4	millimetres	=	1	in.
1	kilometre	=	1093.61	yds.

MEASURES OF SURFACE

1	sq. metre	=	10.764	sq. ft.
.0929	sq. metre	=	1	sq. ft.
1	sq. centimetre	=	.155	sq. in.
6.452	sq. centimetres	=	1	sq. in.
1	sq. millimetre	=	.00155	sq. in.
645.2	sq. millimetres	=	1	sq. in.

MEASURES OF VOLUME

1	cu. metre	=	35.314	cu. ft.
.02832	cu. metre	=	1	cu. ft.
1	cu. decimetre	=	61.023	cu. in.
			.0353	cu. ft.
28.32	cu. decimetres	=	1	cu.ft.
16.387	cu. centimetres	=	1	cu. in.
1	cu. centimetre	=	1	millimetre
			.061	cu. in.

MEASURES OF CAPACITY

1	litre = 1 cu. decimetre	=	61.023	cu. in.
			.0353	cu. ft.
			.2202	gal. (Imperial)
			2.202	lb. of water at 62 deg. fahr.
28.317	litres	=	1	cu. ft. (6.25 Imperial gal.)
4.543	litres	=	1	gal. (Imperial)
3.785	litres	=	1	gal. (American)

MEASURES OF WEIGHT

	Metric			English
28.35	grammes	=	1	oz. avoirdupois
1	kilogramme	=	2.2046	lb.
.4536	kilogramme	=	1	lb.
1 1000	metric ton kilogrammes	=	.9842 19.68	ton of 2240 lb., or cwts. or 2204.6 lb.
1.016 1016	metric tons kilogrammes	=		1 ton of 2240 lb.

MISCELLANEOUS

1	gramme per sq. millimetre	=	1.422	lb. per sq. in.
1	kilogramme per sq. millimetre	=	1422.32	lb. per sq. in.
1	kilogramme per sq. centimetre	=	14.233	lb. per sq. in.
1.0335	kg. per sq. centimetre 1 atmosphere	=	14.7	lb. per sq. in.
0.070308	kilogramme per sq. centimetre	=	1	lb. per sq. in.

Standard Data

MEASURES OF PRESSURE AND WEIGHT

1 lb. per sq. in.	=	144	lb. per sq. ft.
		2.0355	in. of mercury at 32 deg fahr.
		2.0416	in. of mercury at 62 deg. fahr.
		2 309	ft. of water at 62 deg. fahr.
		27 71	in. of water at 62 deg fahr.
1 Atmosphere (14 7 lb. per sq. in.)	=	2116.3	lb. per sq. ft.
		33.947	ft. of water at 62 deg. fahr.
		30	in. of mercury at 62 deg. fahr.
		29.922	in. of mercury at 32 deg. fahr.
		760	millimetres of mercury at 32 deg. fahr.
1 ft. of Water at 62 deg. fahr.	=	0.433	lb. per sq. in.
		62.355	lb. per sq. ft.
1 in. of Mercunry at 62 deg. fahr.	=	0.491	lb. or 7.86 oz. per sq. in.
		1.132	ft. of water at 62 deg. fahr.
		13 58	in. of water at 62 deg. fahr.

WEIGHT OF ONE CUBIC FOOT OF PURE WATER

At 32 deg. fahr. (freezing point)	62.418 lb.
At 39.1 deg. fahr. (maximum density)	62.425 lb.
At 62 deg. fahr. (standard temperature)	62.355 lb.
At 212 deg. fahr. (boiling point, under 1 atmosphere)	59.76 lb.
Imperial gal. = 277.274 cu. in. of water at 62 deg fahr. =	10 lb.
American gal. = 231 cu. in. of water at 62 deg. fahr. =	8.3356 lb.

BOILING POINTS OF VARIOUS FLUIDS

	Degrees Fahr.		Degrees Fahr.
Water, Atmospheric Pressure	212	Refined Petroleum	316
Alcohol	173	Turpentine	315
Sulphuric Acid	240	Sulphur	570
		Linseed Oil	597

MELTING POINTS OF DIFFERENT METALS

	Degrees Fahr.		Degrees Fahr.
Aluminum	1400	Iron (cast)	2450
Antimony	810	Iron (wrought)	2912
Bismuth	476	Lead	608
Brass	1900	Platinum	3080
Bronze	1692	Silver (pure)	1873
Copper	1996	Steel	2500
Glass	2377	Tin	446
Gold (pure)	2590	Zinc	680

Standard Data

SQUARE MEASURE

1 sq. centimeter	0.1550 sq. in.	1 sq. in.	6.452 sq. centimeters
1 sq. decimeter	0.1076 sq. ft.	1 sq. ft.	9.2903 sq. decimeters
1 sq. meter	1.196 sq. yd.	1 sq. yd.	0.8361 sq. m'r
1 are	3.954 sq. rods	1 sq. rd.	0.2529 are
1 hectare	2.47 acres	1 acre	0.4047 hectare
1 sq. kilometer	0.386 sq. m.	1 sq. m.	2.59 sq. kilometers

WEIGHTS

1 gram	0.03527 ounce	1 oz.	28.35 grams
1 kilogram	2.2046 lbs.	1 lb.	0.4536 kilogram
1 metric ton	1.1023 English tons	1 English ton	0.9072 metric ton

APPROXIMATE METRIC EQUIVALENTS

1 decimeter	4 in.	1 liter	1.06 qts. liquid
1 meter	1.1 yds.		0.9 qt. dry
1 kilometer	⅝ of a mile	1 hektoliter	2½ bu.
1 hectare	2½ acres	1 kilogram	2⅕ lb.
1 stere, or cu. meter	¼ of a cord	1 metric ton	2,200 lb.

TROY WEIGHT

24 grains			1 pwt.
20 pwt.	1 oz.	12 oz.	1 lb.

Used for weighing gold, silver and jewels.

APOTHECARIES WEIGHT

20 grains	1 scruple	8 drams	1 oz.
3 scruples	1 dram	12 oz.	1 lb.

Ounce and pound are the same as in Troy Weight.

AVOIRDUPOIS WEIGHT

$27^{11}/_{32}$ grains	1 dram	4 quarters	1 cwt.
16 drams	1 oz.	2,000 lb.	1 short ton
16 oz.	1 lb.	2,240 lb.	1 long ton
25 lb.	1 quarter		

DRY MEASURE

2 pints	1 qt.	4 pecks	1 bu.
8 qts.	1 peck	36 bushels	1 chaldron

LIQUID MEASURE

4 gills	1 pt.	31½ gals.	1 bbl.
2 pts.	1 qt.	2 barrels	1 hogshead
4 qts.	1 gal.		

LONG MEASURE

12 in.	1 ft.	40 rods	1 furlong
3 ft.	1 yd.	8 furlongs	1 sta. mile
5½ yds.	1 rod	3 miles	1 league

CLOTH MEASURE

2¼ in.	1 nail	4 quarters	1 yard
4 nails	1 quarter		

SQUARE MEASURE

144 sq. in.	1 sq. ft.	40 sq. rods	1 rood
9 sq. ft.	1 sq. yard	4 roods	1 acre
30¼ sq. yd.	1 sq. rod	640 acres	1 sq. mile

Standard Data

CIRCUMFERENCE AND AREAS OF CIRCLES

Dia.	Circumference	Area	Dia.	Circumference	Area	Dia.	Circumference	Area.
⅛	.3927	0.0123	16	50.265	201.06	54	169.646	2290.2
¼	7854	0.0491	½	51.836	213.82	55	172.788	2375.8
⅜	1.1781	0.1104	17	53.407	226.98	56	175.929	2463.0
½	1.5708	0.1963	½	54.978	240.52	57	179.071	2551.7
⅝	1.9635	0.3067	18	56.549	254.46	58	182.212	2642.0
¾	2.3562	0.4417	½	58.119	268.80	59	185.354	2733.9
⅞	2.7489	0.6013	19	59.690	283.52	60	188.496	2827.4
1	3.1416	0.7854	½	61.261	298.64	61	191.637	2922.4
⅛	3.5343	0.9940	20	62.832	314.16	62	194.779	3019.0
¼	3.9270	1.227	½	64.403	330.06	63	197.920	3117.2
⅜	4.3197	1.484	21	65.973	346.36	64	201.062	3216.9
½	4.7124	1.767	½	67.544	363.05	65	204.204	3318.3
⅝	5.1051	2.073	22	69.115	380.13	66	207.345	3421.2
¾	5.4978	2.405	½	70.686	397.60	67	210.487	3525.6
⅞	5.8905	2.761	23	72.257	415.47	68	213.628	3631.6
2	6.2832	3.141	½	73.827	433.73	69	216.770	3739.2
¼	7.0686	3.976	24	75.398	452.39	70	219.911	3848.4
½	7.8540	4.908	½	76.969	471.43	71	223.053	3959.2
¾	8.6394	5.939	25	78.540	490.87	72	226.195	4071.5
3	9.4248	7.068	26	81.681	530.93	73	229.336	4185.3
¼	10.210	8.295	27	84.823	572.55	74	232.478	4300.8
½	10.996	9.621	28	87.965	615.75	75	235.619	4417.8
¾	11.781	11.044	29	91.106	660.52	76	238.761	4536.4
4	12.566	12.566	30	94.248	706.86	77	241.903	4656.0
½	14.137	15.904	31	97.389	754.76	78	245.044	4778.3
5	15.708	19.635	32	100.531	804.24	79	248.186	4901.6
½	17.279	23.758	33	103.673	855.30	80	251.327	5026.5
6	18.850	28.274	34	106.814	907.92	81	254.469	5153.0
½	20.420	33.183	35	109.956	962.11	82	257.611	5281.0
7	21.991	38.484	36	113.097	1017.8	83	260.752	5410.6
½	23.562	44.178	37	116.239	1075.2	84	263.894	5541.7
8	25.133	50.265	38	119.381	1134.1	85	267.035	5674.5
½	26.704	56.745	39	122.522	1194.5	86	270.177	5808.8
9	28.274	63.617	40	125.664	1256.6	87	273.319	5944.6
½	29.845	70.882	41	128.805	1320.2	88	276.460	6082.1
10	31.416	78.54	42	131.947	1385.4	89	279.602	6221.1
½	32.987	86.59	43	135.088	1452.2	90	282.743	6361.7
11	34.558	95.03	44	138.230	1520.5	91	285.885	6503.8
½	36.128	103.86	45	141.372	1590.4	92	289.027	6647.6
12	37.699	113.09	46	144.513	1661.9	93	292.168	6792.9
½	39.270	122.71	47	147.655	1734.9	94	295.310	6939.7
13	40.841	132.73	48	150.796	1809.5	95	298.451	7088.2
½	42.412	143.13	49	153.938	1885.7	96	301.593	7238.2
14	43.982	153.93	50	157.080	1963.5	97	304.734	7389.8
½	45.553	165.13	51	160.221	2042.8	98	307.876	7542.9
15	47.124	176.71	52	163.363	2123.7	99	311.018	7697.7
½	48.695	188.69	53	166.504	2206.1			

Standard Data

Specific Heat of Bodies

Material	Specific Heat	Material	Specific Heat	Material	Specific Heat
Cast Iron	0.12983	Gold	0.03244	Glass	0.19768
Wrought Iron	0.11379	Platinum	0.03243	Burnt Clay	0.18500
Lime	0.09555	Lead	0.03140	Brickwood	0.20000
Copper	0.09515	Bismuth	0.03084	Water at 32°	1.00000
Brass	0.09391	Nickel	0.10860	Alcohol (S.G.793)	0.62200
Silver	0.05701	Ice	0.50400	Petroleum	0.43400
Tin	0.05695	Coal	0.27770	Olive Oil	0.30960
Mercury	0.03332	Coke	0.20085	Air	0.2415*

Specific Gravity of Bodies

Body	Specific Gravity	Weight per Cu Ft. in Lb.
Water	1.00	62.5
Aluminum	2.50	156.3
Tin (cast)	7.29	455.6
Steel	7.84	490.0
Cast Iron	7.21	450.6
Wrought Iron	7.68	480.0
Brass	8.38	523.8
Copper	8.79	549.4
Lead (cast)	11.35	709.4
Mercury	13.60	850.0
Platinum	21.50	1343.8

Decimal Equivalents of Fractions

Fraction	Dec. Equiv.	Fraction	Dec. Equiv.	Fraction	Dec. Equiv.	Fraction	Dec. Equiv.
1-64	0.015625	17-64	0.265625	33-64	0.515625	49-64	0.765625
1-32	0.031250	9-32	0.281250	17-32	0.531250	25-32	0.781250
3-64	0.046875	19-64	0.296875	35-64	0.546875	51-64	0.796875
1-16	0.062500	5-16	0.312500	9-16	0.562500	13-16	0.812500
5-64	0.078125	21-64	0.328125	37-64	0.578125	53-64	0.828125
3-32	0.093750	11-32	0.343750	19-32	0.593750	27-32	0.843750
7-64	0.109375	23-64	0.359375	39-64	0.609375	55-64	0.859375
1-8	0.125000	3-8	0.375000	5-8	0.625000	7-8	0.875000
9-64	0.140625	25-64	0.390625	41-64	0.640625	57-64	0.890625
5-32	0.156250	13-32	0.406250	21-32	0.656250	29-32	0.906250
11-64	0.171875	27-64	0.421875	43-64	0.671875	59-64	0.921875
3-16	0.187500	7-16	0.437500	11-16	0.687500	15-16	0.937500
13-64	0.203125	29-64	0.453125	45-64	0.703125	61-64	0.953125
7-32	0.218750	15-32	0.468750	23-32	0.718750	31-32	0.968750
15-64	0.234375	31-64	0.484375	47-64	0.734375	63-64	0.984375
1-4	0.250000	1-2	0.500000	3-4	0.750000	1-	1.000000

Comparison of Temperatures

Standard Data

CENT. = 0.55 X (FAHR − 32)   FAHR = (1.8 X CENT) + 32

CENT.	FAHR	C	F	C	F	C	F	C	F	C	F	C	F
0	32	230	446	460	860	690	1274	920	1688	1150	2102	1380	2516
5	41	235	455	465	869	695	1283	925	1697	1155	2111	1385	2525
10	50	240	464	470	878	700	1292	930	1706	1160	2120	1390	2534
15	59	245	473	475	887	705	1301	935	1715	1165	2129	1395	2543
20	68	250	482	480	896	710	1310	940	1724	1170	2138	1400	2552
25	77	255	491	485	905	715	1319	945	1733	1175	2147	1405	2561
30	86	260	500	490	914	720	1328	950	1742	1180	2156	1410	2570
35	95	265	509	495	923	725	1337	955	1751	1185	2165	1415	2579
40	104	270	518	500	932	730	1346	960	1760	1190	2174	1420	2588
45	113	275	527	505	941	735	1355	965	1769	1195	2183	1425	2597
50	122	280	536	510	950	740	1364	970	1778	1200	2192	1430	2606
55	131	285	545	515	959	745	1373	975	1787	1205	2201	1435	2615
60	140	290	554	520	968	750	1382	980	1796	1210	2210	1440	2624
65	149	295	563	525	977	755	1391	985	1805	1215	2219	1445	2633
70	158	300	572	530	986	760	1400	990	1814	1220	2228	1450	2642
75	167	305	581	535	995	765	1409	995	1823	1225	2237	1455	2651
80	176	310	590	540	1004	770	1418	1000	1832	1230	2246	1460	2660
85	185	315	599	545	1013	775	1427	1005	1841	1235	2255	1465	2669
90	194	320	608	550	1022	780	1436	1010	1850	1240	2264	1470	2678
95	203	325	617	555	1031	785	1445	1015	1859	1245	2273	1475	2687
100	212	330	626	560	1040	790	1454	1020	1868	1250	2282	1480	2696
105	221	335	635	565	1049	795	1463	1025	1877	1255	2291	1485	2705
110	230	340	644	570	1058	800	1472	1030	1886	1260	2300	1490	2714
115	239	345	653	575	1067	805	1481	1035	1895	1265	2309	1495	2723
120	248	350	662	580	1076	810	1490	1040	1904	1270	2318	1500	2732
125	257	355	671	585	1085	815	1499	1045	1913	1275	2327	1505	2741
130	266	360	680	590	1094	820	1508	1050	1922	1280	2336	1510	2750
135	275	365	689	595	1103	825	1517	1055	1931	1285	2345	1515	2759
140	284	370	698	600	1112	830	1526	1060	1940	1290	2354	1520	2768
145	293	375	707	605	1121	835	1535	1065	1949	1295	2363	1525	2777
150	302	380	716	610	1130	840	1544	1070	1958	1300	2372	1530	2786
155	311	385	725	615	1139	845	1553	1075	1967	1305	2381	1535	2795
160	320	390	734	620	1148	850	1562	1080	1976	1310	2390	1540	2804
165	329	395	743	625	1157	855	1571	1085	1985	1315	2399	1545	2813
170	338	400	752	630	1166	860	1580	1090	1994	1320	2408	1550	2822
175	347	405	761	635	1175	865	1589	1095	2003	1325	2417	1555	2831
180	356	410	770	640	1184	870	1598	1100	2012	1330	2426	1560	2840
185	365	415	779	645	1193	875	1607	1105	2021	1335	2435	1565	2849
190	374	420	788	650	1202	880	1616	1110	2030	1340	2444	1570	2858
195	383	425	797	655	1211	885	1625	1115	2039	1345	2453	1575	2867
200	392	430	806	660	1220	890	1634	1120	2048	1350	2462	1580	2876
205	401	435	815	665	1229	895	1643	1125	2057	1355	2471	1585	2885
210	410	440	824	670	1238	900	1652	1130	2066	1360	2480	1590	2894
215	419	445	833	675	1247	905	1661	1135	2075	1365	2489	1595	2903
220	428	450	842	680	1256	910	1670	1140	2084	1370	2498	1600	2912
225	437	455	851	685	1265	915	1679	1145	2093	1375	2507		

Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET-1.

Cu. Ft. of Air per Minute	500	600	700	800	900	1000	1200	1500	1800	2000	2200	2500	2800	3000	3500	4000
200	9	8	8	7	7	7	6	6	6	6	6	6	6	6	6	6
300	11	10	9	9	8	8	7	7	6	6	6	6	6	6	6	6
400	13	11	11	10	9	9	8	8	7	7	6	6	6	6	6	6
500	14	13	12	11	11	10	9	8	8	7	7	7	6	6	6	6
600	15	14	13	12	11	11	10	9	8	8	8	7	7	7	6	6
700	16	15	14	13	12	12	11	10	9	9	8	8	7	7	7	6
800	18	16	15	14	13	13	12	10	9	9	9	8	8	8	7	7
900	19	17	16	15	14	13	12	11	10	10	9	9	8	8	8	7
1000	20	18	16	16	15	14	13	12	10	10	10	9	9	8	8	7
1100	21	19	18	16	16	15	13	12	11	11	10	9	9	9	8	8
1200	21	20	18	17	16	15	14	13	11	11	10	10	9	9	9	8
1300	22	20	19	18	17	16	15	13	12	11	11	10	10	10	9	8
1400	23	21	20	18	17	16	15	14	12	12	11	11	10	10	9	9
1500	24	22	20	19	18	17	16	14	13	12	12	11	10	10	9	9
1600	25	23	21	20	18	18	16	15	13	13	12	11	11	11	10	9
1700	25	24	21	20	19	18	17	15	14	13	12	12	11	11	10	9
1800	26	24	22	21	20	19	17	15	14	13	13	12	11	11	10	10
1900	27	24	23	21	20	19	18	16	14	14	13	12	12	11	10	10
2000	28	25	23	22	21	20	18	16	15	14	13	13	12	12	11	10
2100	28	26	24	22	21	20	18	16	15	14	14	13	12	12	11	10
2200	29	27	24	23	22	21	19	17	15	15	14	13	12	12	11	11
2300	30	27	25	23	22	21	19	17	16	15	15	13	13	12	11	11
2400	30	28	25	24	23	21	20	18	16	15	15	14	13	13	12	11
2500	31	28	26	24	23	22	20	18	16	16	15	14	13	13	12	11
2600	31	29	27	25	23	22	20	18	17	16	15	15	14	13	12	11
2700	32	29	27	25	24	23	21	19	17	16	15	15	14	13	12	12
2800	33	30	28	26	24	23	21	19	18	16	16	15	14	14	13	12
2900	33	30	28	26	25	24	22	19	18	17	16	15	14	14	13	12
3000	34	31	29	27	25	24	22	20	18	17	16	15	15	14	13	12
3100	34	31	29	27	26	24	22	20	18	17	17	15	15	14	13	12
3200	34	32	30	28	26	25	23	20	19	18	17	15	15	15	13	13
3300	35	32	30	28	26	25	23	21	19	18	17	16	15	15	14	13
3400	36	33	30	28	27	25	23	21	19	18	17	16	15	15	14	13
3500	36	33	31	29	27	26	24	21	19	18	18	16	16	15	15	14
3600	37	34	31	29	28	26	24	21	20	19	18	16	16	15	15	14

Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET-2

CU. FT. OF AIR PER MINUTE	500	600	700	800	900	1000	1200	1500	1800	2000	2200	2500	2800	3000	3500	4000
3700	37	34	32	30	28	27	24	22	20	19	18	17	16	16	14	14
3800	38	35	32	30	28	27	25	22	21	19	18	17	16	16	15	14
3900	38	35	32	30	29	27	25	22	21	19	19	17	16	16	15	14
4000	39	35	33	31	29	28	25	22	21	20	19	18	17	16	15	14
4100	39	36	33	31	29	28	26	23	21	20	19	18	17	16	15	14
4200	40	36	34	32	30	28	26	23	21	20	19	18	17	16	15	14.
4300	40	37	34	32	30	29	26	23	21	20	19	18	17	17	15	15
4400	41	37	34	32	30	29	26	24	22	21	20	18	17	17	16	15
4500	41	38	35	33	31	29	27	24	22	21	20	19	18	17	16	15
4600	42	38	35	33	31	30	27	24	22	21	20	19	18	17	16	15
4700	42	38	36	34	31	30	27	24	22	21	20	19	18	17	16	15
4800	42	39	36	34	32	30	28	25	22	21	20	19	18	18	16	15
4900	43	39	36	34	32	30	28	25	23	22	21	19	18	18	16	16
5000	43	40	37	34	32	31	28	25	23	22	21	20	19	18	17	16
5100	43	40	37	35	33	31	28	25	23	22	21	20	19	18	17	16
5200	44	40	37	35	33	31	29	25	24	22	21	20	19	18	17	16
5300	45	41	38	35	33	32	29	26	24	23	22	20	19	18	17	16
5400	45	41	38	35	33	32	29	26	24	23	22	21	19	18	18	16
5500	45	41.	38	36	34	32	29	26	24	23	22	21	19	18	18	16
5600	45	41	39	36	34	33	30	27	24	23	22	21	20	19	18	17
5700	46	42	39	37	34	33	30	27	24	23	22	21	20	19	18	17
5800	46	42	39	37	35	33	30	27	25	24	22	21	20	19	18	17
5900	46	42	40	37	36	33	30	27	25	24	22	21	20	19	18	17
6000	47	43	40	38	36	34	31	28	25	24	23	21	20	20	18	17
6100	47	43	40	38	36	34	31	28	25	24	23	21	20	20	18	17
6200	48	43	41	88	36	34	31	28	25	24	23	21	21	20	18	17
6300	48	44	41	38	36	34	31	28	25	24	23	22	21	20	18	17
6400	48	44	41	39	37	35	32	28	26	25	24	22	21	20	19	18
6500	49	44	41	39	37	36	32	29	26	25	24	22	21	20	19	18
6600	50	45	42	39	37	36	32	29	26	25	24	22	21	21	19	18
6700	50	45	42	40	37	36	32	29	27	25	24	22	21	21	19	18
6800	50	46	43	40	38	36	33	29	27	25	24	23	21	21	19	18
6900	50	46	43	40	38	36	33	30	27	25	24	23	21	21	19	18
7000	51	46	43	40	38	36	33	30	27	26	24	23	22	21	20	19
7100	51	46	44	41	38	37	33	30	27	26	25	23	22	21	20	19

Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET – 3

CU. FT. OF AIR PER MINUTE	500	600	700	800	900	1000	1200	1500	1800	2000	2200	2500	2800	3000	3500	4000
7200	52	47	44	41	39	37	34	30	28	26	25	23	22	21	20	19
7300	53	47	44	41	39	37	34	30	28	26	25	24	22	21	20	19
7400	53	48	44	41	39	37	34	30	28	27	25	24	22	21	20	19
7500	53	48	45	42	40	38	34	31	28	27	25	24	22	21	20	19
7600	53	48	45	42	40	38	34	31	28	27	25	24	23	22	20	19
7700	53	49	45	42	40	38	35	31	28	27	26	24	23	22	21	19
7800	54	48	46	43	40	38	36	31	29	27	26	24	23	22	21	19
7900	54	49	46	43	40	39	36	31	29	27	26	24	23	22	21	19
8000	54	49	46	43	41	39	36	32	29	28	26	25	24	22	21	20
8100	55	50	46	43	41	39	36	32	29	28	26	25	24	23	21	20
8200	55	50	46	43	41	39	36	32	29	28	27	25	24	23	21	20
8300	55	50	47	43	41	40	36	32	30	28	27	25	24	23	21	20
8400	56	51	47	44	41	40	36	33	30	28	27	25	24	23	21	20
8500	56	51	47	44	41	40	36	33	30	28	27	25	24	23	21	20
8600	56	51	48	44	42	40	37	33	30	29	27	25	24	23	21	20
8700	56	52	48	45	42	40	37	33	30	29	28	25	24	24	21	20
8800	57	52	48	45	42	41	37	33	30	29	28	26	24	24	22	21
8900	57	52	48	45	43	41	37	33	30	29	28	26	24	24	22	21
9000	57	52	49	45	43	41	38	34	31	29	28	26	25	24	22	21
9100	58	53	49	46	43	41	38	34	31	29	28	26	25	24	22	21
9200	58	53	49	46	43	41	38	34	31	30	28	26	25	24	22	21
9300	58	53	49	46	44	42	38	34	31	30	28	27	25	24	22	21
9400	59	53	50	46	44	42	38	34	31	30	28	27	25	24	22	21
9500	59	54	50	47	44	42	39	34	31	30	29	27	25	24	23	21
9600	59	54	50	47	44	42	39	35	32	30	29	27	25	25	23	21
9700	60	54	51	47	45	43	39	35	32	30	29	27	25	25	23	21
9800	60	55	51	47	45	43	39	36	32	30	29	27	26	25	23	21
9900	60	55	51	48	45	43	39	36	32	30	29	27	26	25	23	21
10000	61	55	52	48	45	43	40	36	32	31	29	28	26	25	23	22
10500	61	57	53	49	46	44	41	36	32	31	30	28	27	26	24	22
11000	62	58	54	40	47	45	41	37	33	31	31	29	27	26	24	23
11500	62	59	55	51	48	46	42	37	34	32	31	30	28	27	25	23
12000	63	60	56	52	49	47	43	39	35	34	32	30	28	28	25	24
12500	64	61	57	53	50	48	44	40	36	34	33	31	30	28	26	24
13000	65	62	58	54	51	49	45	40	37	35	33	31	30	29	27	25

Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

Sheet – 4

Cu. Ft of Air per Minute	500	600	700	800	900	1000	1200	1500	1800	2000	2200	2500	2800	3000	3500	4000
13500	70	64	59	56	52	50	46	41	38	35	34	32	30	29	27	25
14000	72	65	61	57	53	51	47	42	38	36	34	33	31	30	28	26
14500	73	66	61	57	54	52	47	42	39	37	35	33	31	30	28	26
15000	74	68	62	59	56	53	48	43	40	38	36	34	32	31	28	27
15500	75	69	64	59	56	54	49	44	40	38	36	35	32	31	29	27
16000	77	70	65	60	59	55	50	45	41	39	37	35	33	32	29	28
16500	78	71	65	61	58	56	51	45	41	39	38	36	33	32	30	28
17000	79	73	66	62	59	56	51	46	42	40	38	36	34	33	30	28
17500	80	73	68	64	59	57	52	47	43	40	39	37	34	33	31	29
18000	81	74	68	64	60	58	53	47	43	41	39	37	35	34	31	29
18500	82	75	70	65	60	59	54	48	44	42	40	38	35	34	31	30
19000	83	75	70	65	62	60	54	49	44	42	40	38	35	34	32	30
19500	85	77	72	62	62	60	55	49	45	43	41	39	36	35	32	30
20000	86	78	73	68	64	61	56	50	46	43	41	39	37	35	33	31
20500	87	79	73	68	64	62	56	50	46	44	42	39	37	36	33	31
21000	88	80	74	69	65	63	57	51	47	44	42	40	38	36	34	31
21500	89	81	74	70	66	63	58	52	47	45	43	40	38	37	34	32
22000	90	81	75	70	66	64	58	52	48	45	43	41	38	37	34	32
22500	91	82	77	72	68	65	59	53	48	46	44	41	39	38	35	33
23000	92	83	78	73	68	65	60	53	49	46	44	42	39	38	35	33
23500	93	85	79	73	69	66	60	54	49	47	45	42	40	38	35	33
24000	94	86	79	74	69	67	61	55	50	47	45	42	40	39	36	34
24500	95	87	80	74	71	68	62	55	50	48	45	43	40	39	36	34
25000	96	87	80	75	72	68	62	56	51	48	46	43	41	40	37	34
25500	97	88	81	77	72	69	63	56	51	49	46	44	41	40	37	34
26000	98	89	82	77	73	70	63	57	52	49	47	44	42	40	38	35
26500	99	90	83	78	73	70	64	57	52	50	47	45	42	41	38	35
27000	100	91	83	79	74	71	65	58	53	50	48	46	42	41	38	36
27500	101	92	85	79	74	72	65	58	53	51	48	45	43	41	38	36
28000	102	92	86	80	75	72	66	59	54	51	49	46	43	42	39	36
28500	103	93	87	80	76	73	66	60	54	52	49	46	44	42	39	37
29000	104	94	87	81	77	73	67	60	55	52	50	47	44	42	39	37
29500	105	95	88	82	77	74	68	60	55	52	50	47	44	43	40	37
30000	106	96	89	82	78	75	68	61	56	53	50	47	45	43	40	38
30500	107	97	89	83	79	75	69	62	56	53	51	48	45	44	40	38

Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET – 5

Cu. Ft. of Air per Minute	500	600	700	800	900	1000	1200	1500	1800	2000	2200	2500	2800	3000	3500	4000
31000	107	97	90	85	79	76	69	62	57	54	51	48	45	44	41	38
31500	108	98	91	85	80	76	70	63	57	54	52	49	46	44	41	39
32000	109	99	91	86	80	77	70	63	57	55	52	49	46	45	41	39
32500	110	100	92	86	81	78	71	63	58	55	52	49	47	45	42	39
33000	110	101	93	87	81	78	72	64	58	56	53	50	47	45	42	39
33500	111	102	94	88	82	79	72	64	59	56	53	50	47	46	42	40
34000	112	102	94	88	83	79	73	65	59	56	54	50	48	46	43	40
34500	113	103	95	89	85	80	73	65	60	57	54	51	48	46	43	40
35000	114	104	86	90	85	81	74	66	60	57	54	51	48	47	43	40
35500	115	105	96	90	86	81	74	66	61	57	55	52	49	47	44	41
36000	115	106	97	91	86	82	75	67	61	58	55	52	49	47	44	41
36500	116	106	98	91	87	82	75	67	61	58	56	52	49	48	44	41
37000	117	107	99	92	87	83	76	68	62	59	56	52	50	48	44	42
37500	118	107	100	93	88	83	76	68	62	59	56	53	50	48	45	42
38000	119	108	101	93	88	84	77	69	63	60	57	53	50	49	45	42
38500	119	109	102	94	89	85	77	69	63	60	57	54	51	49	45	42
39000	120	110	102	95	89	85	78	70	63	60	57	54	51	49	46	43
39500	121	110	103	95	90	86	78	70	64	61	58	54	51	50	46	43
40000	122	110	103	96	90	86	79	71	64	61	58	55	52	50	46	43
40500	122	111	104	96	91	87	79	71	65	61	59	55	52	50	46	44
41000	123	112	104	97	91	88	79	71	65	62	59	55	52	50	47	44
41500	124	113	105	98	92	88	80	72	65	62	59	56	52	50	47	44
42000	125	114	105	98	92	88	81	72	66	63	60	56	53	51	47	44
42500	125	115	106	99	93	89	81	73	68	63	60	56	53	51	48	44
43000	126	115	106	99	93	89	82	73	66	63	60	57	53	51	48	44
43500	127	116	107	100	94	90	82	73	67	63	61	57	53	51	48	45
44000	127	116	108	101	95	90	82	74	67	64	61	57	54	52	48	45
44500	128	117	108	101	95	91	83	74	68	64	61	58	54	52	49	46
45000	129	118	109	102	96	91	83	75	68	65	62	58	55	53	49	46
45500	130	119	110	102	96	92	84	75	68	65	62	58	55	53	49	46
46000	130	119	110	103	97	93	84	75	69	65	62	59	55	53	50	46
46500	131	120	110	103	97	93	85	76	69	66	63	59	56	54	50	47
47000	132	120	111	104	98	93	85	76	70	66	63	59	56	54	50	47
47500	132	121	112	104	99	94	86	77	70	66	63	60	56	54	50	47
48000	133	122	113	105	100	95	86	77	70	67	64	60	56	55	50	47

Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET - 6

Cu. Ft. of Air per Minute	500	600	700	800	900	1000	1200	1500	1800	2000	2200	2500	2800	3000	3500	4000
48500	—	—	113	105	100	95	87	77	71	67	64	60	57	55	51	47
49000	—	—	114	106	100	95	87	78	71	68	64	60	57	55	51	48
49500	—	—	114	107	101	96	87	78	72	68	65	61	57	56	51	48
50000	—	—	115	107	101	96	88	79	72	68	65	61	58	56	51	48
50500	—	—	115	108	102	97	88	79	72	68	65	61	58	56	52	49
51000	—	—	115	108	102	97	89	79	73	69	66	62	58	56	52	49
51500	—	—	116	109	103	98	89	80	73	69	66	62	58	56	52	49
52000	—	—	117	110	103	98	90	80	73	70	66	62	59	57	53	49
52500	—	—	118	110	104	99	90	81	74	70	67	63	59	57	53	50
53000	—	—	118	110	104	99	90	81	74	70	67	63	59	57	53	50
53500	—	—	119	111	104	99	91	81	74	70	67	63	60	58	53	50
54000	—	—	119	111	105	100	91	82	75	71	68	63	60	58	54	50
54500	—	—	120	112	105	100	92	82	75	71	68	64	60	58	54	50
55000	—	—	—	113	106	101	92	82	75	72	68	64	60	58	54	51
55500	—	—	—	113	106	101	93	83	76	72	68	64	61	59	54	51
56000	—	—	—	114	107	102	93	83	76	72	69	65	61	59	55	51
56500	—	—	—	114	107	102	93	84	76	72	69	65	61	59	55	51
57000	—	—	—	115	108	103	94	84	77	73	69	65	62	60	55	52
57500	—	—	—	115	109	103	94	84	77	73	70	65	62	60	55	52
58000	—	—	—	116	109	104	95	85	77	73	70	66	62	60	56	52
58500	—	—	—	116	110	104	95	85	78	74	70	66	62	60	56	52
59000	—	—	—	117	110	104	95	85	78	74	71	66	63	60	56	52
59500	—	—	—	117	110	105	96	86	78	74	71	67	63	61	56	53
60000	—	—	—	118	110	105	96	86	79	75	71	67	63	61	57	53
60500	—	—	—	118	111	106	97	86	79	75	72	67	63	61	57	53
61000	—	—	—	119	111	106	97	87	79	75	72	67	64	62	57	53
61500	—	—	—	119	112	107	97	87	80	76	72	68	64	62	57	53
62000	—	—	—	120	113	107	98	88	80	76	72	68	64	62	57	54
62500	—	—	—	—	113	108	98	88	80	76	73	68	64	62	58	54
63000	—	—	—	—	114	108	98	88	80	76	73	68	65	63	58	54
63500	—	—	—	—	114	109	99	89	80	77	73	69	65	63	58	54
64000	—	—	—	—	115	109	99	89	81	77	73	69	65	63	58	55
64500	—	—	—	—	115	110	100	89	81	77	74	69	65	63	58	55
65000	—	—	—	—	115	110	100	90	81	78	74	70	66	64	59	55
65500	—	—	—	—	116	110	101	90	82	78	74	70	66	64	59	55

Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET — 7

CU. FT AIR PER-MIN	2000	2200	2500	2800	3000	3500	4000	CU FT AIR PER-MIN	2000	2200	2500	2800	3000	3500	4000
66000	78	75	70	66	64	59	56	83500	88	84	79	74	72	67	62
66500	79	75	70	66	64	60	56	84000	88	84	79	75	72	67	63
67000	79	75	71	67	64	60	56	84500	88	84	79	75	72	67	63
67500	79	75	71	67	65	60	56	85000	89	85	79	75	73	67	63
68000	79	76	71	67	65	60	56	85500	89	85	80	75	73	67	63
68500	80	76	71	67	65	60	57	86000	89	85	80	76	73	68	63
69000	80	76	71	68	65	61	57	86500	89	85	80	76	73	68	63
69500	80	76	72	68	66	61	57	87000	90	86	80	76	74	68	64
70000	81	77	72	68	66	61	57	87500	90	86	81	76	74	68	64
70500	81	77	72	68	66	61	57	88000	90	86	81	76	74	68	64
71000	81	77	73	69	66	61	57	88500	91	86	81	77	74	68	64
71500	81	78	73	69	67	62	58	89000	91	87	81	77	74	69	64
72000	82	78	73	69	67	62	58	89500	91	87	82	77	74	69	64
72500	82	78	73	69	67	62	58	90000	91	87	82	77	75	69	65
73000	82	78	74	70	67	62	58	90500	92	87	82	77	75	69	65
73500	82	79	74	70	68	63	58	91000	92	88	82	78	75	70	65
74000	83	79	74	70	68	63	59	91500	92	88	82	78	75	70	65
74500	83	79	74	70	68	63	59	92000	92	88	83	78	75	70	65
75000	83	79	75	71	68	63	59	92500	93	88	83	79	76	70	66
75500	84	80	75	71	68	63	59	93000	93	89	83	79	76	70	66
76000	84	80	75	71	69	64	60	93500	93	89	83	79	76	70	66
76500	84	80	75	71	69	64	60	94000	93	89	84	79	76	71	66
77000	85	81	76	72	69	64	60	94500	94	89	84	79	76	71	66
77500	85	81	76	72	69	64	60	95000	94	89	84	79	77	71	66
78000	85	81	76	72	70	64	60	95500	94	90	84	80	77	71	67
78500	85	81	76	72	70	65	60	96000	94	90	84	80	77	71	67
79000	86	82	77	72	70	65	61	96500	95	90	84	80	77	72	67
79500	86	82	77	73	70	65	61	97000	95	90	85	80	77	72	67
80000	86	82	77	73	70	65	61	97500	95	90	85	80	78	72	67
80500	86	82	77	73	71	65	61	98000	95	91	85	81	78	72	68
81000	87	83	78	73	71	66	61	98500	95	91	85	81	78	72	68
81500	87	83	78	74	71	66	62	99000	96	91	86	81	78	72	68
82000	87	83	78	74	71	66	62	99500	96	92	86	81	78	73	68
82500	87	83	78	74	72	66	62	100000	96	92	86	81	79	73	68
83000	88	84	79	74	72	66	62								

Size of Round and Rectangular Flues Required for the Passage of a Given Volume of Air at a Given Velocity

SHEET-1

FT. VEL. PER MIN.		CUBIC FEET OF AIR PER MINUTE									
		100	200	300	400	500	1000	1500	2000	2500	3000
350	AREA	46.1	82.3	124	165	206	411	617	823	1028	1234
	DIAM	8	10	13	15	16	23	28	33	37	40
	RECT	6X8	8X12	12X12	12X14	12X18	18X24	22X28	24X36	28X38	28X44
400	AREA	36	72	108	144	180	360	540	720	900	1080
	DIAM	7	10	12	14	16	22	27	31	34	37
	RECT	6X6	8X10	10X12	12X12	12X16	18X20	20X28	24X30	28X32	28X40
450	AREA	32	64	96	128	160	320	480	640	800	960
	DIAM	7	10	12	13	15	20	25	29	32	35
	RECT	6X6	8X8	8X12	12X12	12X14	16X20	20X24	24X28	28X30	28X34
500	AREA	29	58	87	116	144	290	434	580	724	870
	DIAM	7.	9	11	13	14	20	24	28	31	34
	RECT	6X6	8X8	8X12	10X12	12X12	16X18	20X22	24X24	26X28	28X32
550	AREA	26	52	79	105	131	262	393	524	655	786
	DIAM	6	9	10	12	13	19	22	26	29	32
	RECT	6X6	8X8	8X10	10X12	10X14	16X18	20X20	22X24	24X28	28X28
600	AREA	24	48	72	96	120	240	360	480	600	720
	DIAM	6	8	10	11	13	18	22	25	28	31
	RECT	4X6	6X8	6X12	8X12	10X12	16X16	18X20	20X24	24X26	26X28
650	AREA	22	44	67	89	112	222	333	442	564	664
	DIAM	8	8	10	11	12	17	21	24	27	29
	RECT	4X6	6X8	6X12	8X12	10X12	14X16	18X18	20X22	24X24	26X26
700	AREA	21	42	63	83.	103	206	309	410	513	618
	DIAM	6	8	9	11	12	16	20	23	26	28
	RECT	4X6	6X8	6X10	8X12	10X10	14X16	16X20	20X22	22X24	24X26
750	AREA	19	39	57	77	96	192	228	384	480	576
	DIAM	5	8	9	10	11	16	19	22	25	27
	RECT	4X6	6X8	6X10	8X10	10X10	14X14	16X18	20X20	22X22	24X24
800	AREA	18	36	54	72	90	180	270	360	450	540
	DIAM	5	7	9	10	11	16	19	22	24	27
	RECT	4X6	6X6	6X10	8X10	8X12	14X14	16X18	18X20	22X22	24X24

Size of Round and Rectangular Flues Required for the Passage of a Given Volume of Air at a Given Velocity

SHEET-2

FT. VEL. PER MIN.		CUBIC FEET OF AIR PER MINUTE.									
		100	200	300	400	500	1000	1500	2000	2500	3000
850	AREA	17	34	51	68	85	170	225	340	425	510
	DIAM	5	7	9	10	11	15	18	21	24	26
	RECT	4X6	6X6	6X10	8X10	8X12	14X14	16X16	18X18	20X22	22X24
900	AREA	16	32	48	64	80	160	240	320	400	480
	DIAM	5	7	8	9	11	15	18	21	23	25
	RECT	4X4	6X6	6X8	8X8	8X10	12X14	16X16	18X18	20X20	22X22
950	AREA	16	31	46	61	76	152	228	304	380	456
	DIAM	5	7	8	9	10	14	17	20	22	24
	RECT	4X4	6X6	6X8	8X8	8X10	12X14	14X16	18X18	20X20	22X22
1000	AREA	15	29	44	58	72	144	216	288	360	432
	DIAM	5	7	8	9	10	14	17	20	22	24
	RECT	4X4	6X6	6X8	8X8	8X10	12X12	14X16	16X18	18X20	20X22
1050	AREA	14	28	42	56	69	138	207	276	345	414
	DIAM	5	6	8	9	10	14	17	19	21	23
	RECT	4X4	6X6	6X8	8X8	8X10	12X12	14X16	16X18	18X20	20X22
1100	AREA	13	26	40	53	68	130	195	260	325	390
	DIAM	5	6	8	9	10	13	16	19	21	23
	RECT	4X4	6X6	6X8	8X8	8X10	12X12	14X14	16X18	18X18	20X20
1150	AREA	13	25	38	50	62	126	189	251	314	377
	DIAM	5	6	7	8	9	13	16	18	20	22
	RECT	4X4	6X6	6X8	8X8	8X8	12X12	14X14	16X16	18X18	20X20
1200	AREA	12	24	36	48	60	120	180	240	300	360
	DIAM	4	6	7	8	9	13	16	18	20	22
	RECT	4X4	4X6	6X6	6X8	8X8	10X12	12X16	16X16	18X18	18X20
1250	AREA	12	23	36	46	58	115	173	231	289	347
	DIAM	4	6	7	8	9	13	15	18	20	21
	RECT	4X4	4X6	6X6	6X8	8X8	10X12	12X14	14X16	16X20	16X22

Size of Round and Rectangular Flues Required for the Passage of a Given Volume of Air at a Given Velocity

SHEET-3

FT. VEL. PER MIN		CUBIC FEET OF AIR PER MINUTE.									
		3500	4000	4500	5000	5500	6000	6500	7000	7500	8000
350	AREA	1439	1646	1850	2056	2261	2467	2672	2880	3083	3291
	DIAM	43	46	49	52	54	56	59	61	63	65
	RECT	28X52	36X46	36X52	36X58	46X50	48X52	48X56	48X60	48X66	48X70
400	AREA	1260	1440	1620	1800	1980	2160	2340	2520	2700	2880
	DIAM	40	43	46	48	51	53	55	57	59	61
	RECT	28X46	30X48	36X46	36X50	42X48	42X52	42X56	48X54	48X58	48X60
450	AREA	1120	1280	1440	1600	1760	1920	2080	2240	2400	2560
	DIAM	38	41	43	46	48	50	52	54	56	57
	RECT	28X40	30X44	36X43	36X46	42X42	42X46	42X50	42X54	42X58	42X62
500	AREA	1014	1160	1324	1450	1594	1740	1884	2030	2160	2304
	DIAM	36	39	41	43	45	47	49	51	53	55
	RECT	30X34	30X40	34X40	36X42	38X42	42X42	42X46	42X50	42X52	42X56
550	AREA	917	1048	1179	1310	1441	1572	1703	1834	1965	2096
	DIAM	35	37	39	41	43	45	47	49	50	52
	RECT	28X34	28X38	34X36	36X38	36X40	36X44	42X42	42X44	42X48	42X50
600	AREA	840	960	1080	1200	1320	1440	1560	1680	1800	1920
	DIAM	33	35	38	400	41	43	45	47	48	50
	RECT	28X30	28X34	32X34	34X36	36X38	36X40	36X44	36X48	36X50	42X46
650	AREA	774	885	996	1106	1217	1330	1441	1554	1665	1776
	DIAM	33	34	36	38	40	42	43	45	46	48
	RECT	28X28	28X32	28X36	30X36	34X36	36X38	36X40	36X44	36X46	42X44
700	AREA	721	824	927	1030	1133	1236	1339	1440	1547	1650
	DIAM	31	33	35	37	38	40	41	43	45	46
	RECT	26X28	28X30	28X34	30X36	30X38	30X42	36X38	36X40	36X44	36X46
750	AREA	672	768	864	960	1056	1152	1248	1344	1440	1536
	DIAM	30	32	34	35	37	39	40	42	43	45
	RECT	24X28	28X28	28X32	30X32	32X34	34X34	36X36	36X38	36X40	36X44
800	AREA	630	720	810	900	990	1080	1170	1260	1350	1440
	DIAM	29	31	33	34	36	38	39	40	42	43
	RECT	24X26	26X28	28X30	30X30	30X34	32X34	34X36	36X36	36X38	36X40

Size of Round and Rectangular Flues Required for the Passage of a Given Volume of Air at a Given Velocity

SHEET-4

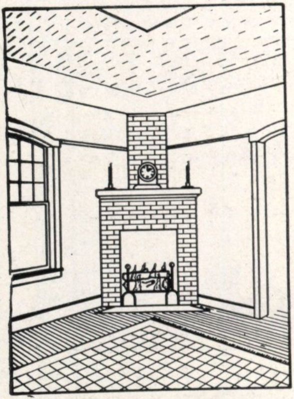
FT. VEL. PER MIN.		CUBIC FEET OF AIR PER MINUTE									
		3500	4000	4500	5000	5500	6000	6500	7000	7500	8000
850	AREA	595	680	765	850	935	1020	1105	1190	1275	1360
	DIAM	28	30	32	33	35	36	38	39	41	42
	RECT	24X26	26X26	28X28	30X30	30X32	30X34	34X34	34X36	36X36	36X38
900	AREA	560	640	720	800	880	960	1040	1120	1200	1280
	DIAM	27	29	31	32	34	35	37	38	40	41
	RECT	24X24	24X26	26X28	28X30	30X30	30X32	30X36	30X38	30X40	36X36
950	AREA	532	608	684	760	836	912	988	1064	1140	1216
	DIAM	26	28	30	31	33	34	36	37	38	40
	RECT	22X24	24X26	24X30	24X32	24X36	24X38	24X42	30X36	30X38	30X42
1000	AREA	504	576	648	720	792	864	936	1008	1080	1150
	DIAM	26	28	29	31	32	34	36	36	38	39
	RECT	22X24	22X26	24X28	24X30	24X34	24X36	24X40	30X34	30X38	30X40
1050	AREA	483	552	621	690	759	828	897	966	1035	1104
	DIAM	25	27	29	30	31	33	34	35	37	38
	RECT	20X24	22X26	24X26	24X30	24X32	24X36	24X38	24X40	24X44	30X38
1100	AREA	455	520	585	650	715	780	845	910	975	1040
	DIAM	24	26	28	29	31	32	33	34	36	37
	RECT	20X24	22X24	24X26	24X28	24X30	24X34	24X36	24X38	24X42	24X44
1150	AREA	440	503	566	629	692	755	814	877	940	1003
	DIAM	24	26	27	29	30	31	32	34	35	36
	RECT	20X22	22X22	24X24	24X26	24X30	24X32	24X34	24X38	24X40	24X42
1200	AREA	420	480	540	600	660	720	780	840	900	960
	DIAM	24	25	27	28	29	31	32	33	34	36
	RECT	20X22	22X22	24X24	24X26	24X28	24X30	24X34	24X36	24X38	24X40
1250	AREA	405	463	521	579	634	692	750	808	866	924
	DIAM	23	25	26	28	29	30	31	32	34	35
	RECT	18X22	18X26	20X26	20X30	22X30	22X32	22X34	24X34	24X36	24X38

Horse-Power of a Leather Belt One Inch Wide

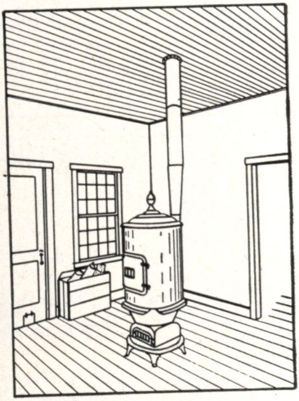
Velocity in feet per Second	Laced Belts—Thickness in Inches						
	$\frac{1}{7}$ .143	$\frac{1}{6}$ .167	$\frac{3}{16}$ .187	$\frac{7}{32}$ .219	$\frac{1}{4}$ .250	$\frac{5}{16}$ .312	$\frac{1}{3}$ .333
10	.51	.59	.63	.73	.84	1.05	1.18
15	.75	.88	1.00	1.16	1.32	1.66	1.77
20	1.00	1.17	1.32	1.54	1.75	2.19	2.34
25	1.23	1.43	1.61	1.88	2.16	2.69	2.86
30	1.47	1.72	1.93	2.25	2.58	3.22	3.44
35	1.69	1.97	2.22	2.59	2.96	3.70	3.94
40	1.90	2.22	2.49	2.90	3.32	4.15	4.44
45	2.09	2.45	2.75	3.21	3.67	4.58	4.89
50	2.27	2.65	2.98	3.48	3.98	4.97	5.30
55	2.44	2.84	3.19	3.72	4.26	5.32	5.69
60	2.58	3.01	3.38	3.95	4.51	5.64	6.02
65	2.71	3.16	3.55	4.14	4.74	5.92	6.32
70	2.81	3.27	3.68	4.29	4.91	6.14	6.54
75	2.89	3.37	3.79	4.42	5.05	6.31	6.73
80	2.94	3.43	3.86	4.50	5.15	6.44	6.86
85	2.97	3.47	3.90	4.55	5.20	6.50	6.93
90	2.97	3.47	3.90	4.55	5.20	6.50	6.93

The horse-power becomes a maximum at 87.41 feet per second, 5,245 per minute.

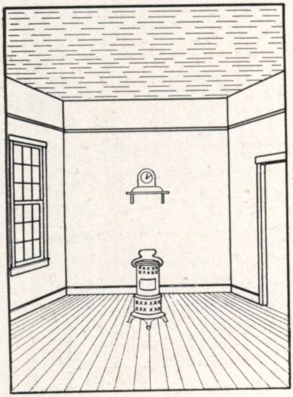
The Evolution of Heating Systems



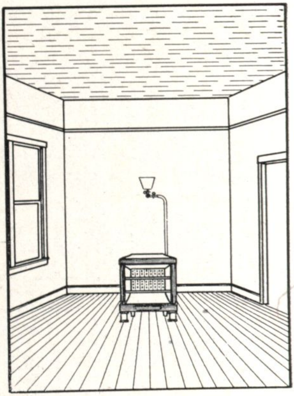
Open Fire Place



Wood Burning Stove



Oil Heater



Gas Heater

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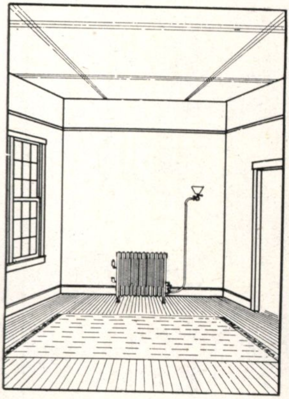
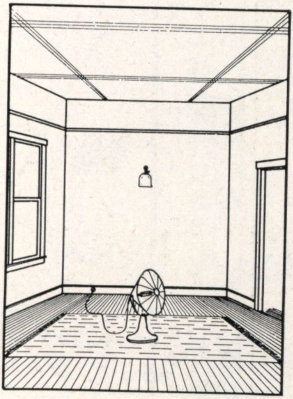
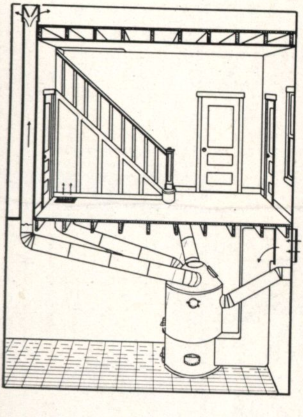


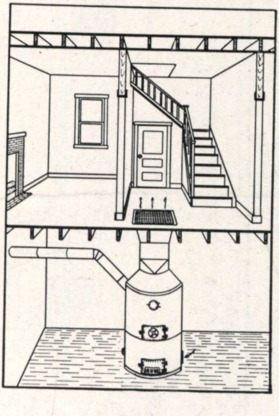
Gas Steam Radiator



Electric Heater



Hot Air Furnace



Pipeless Furnace

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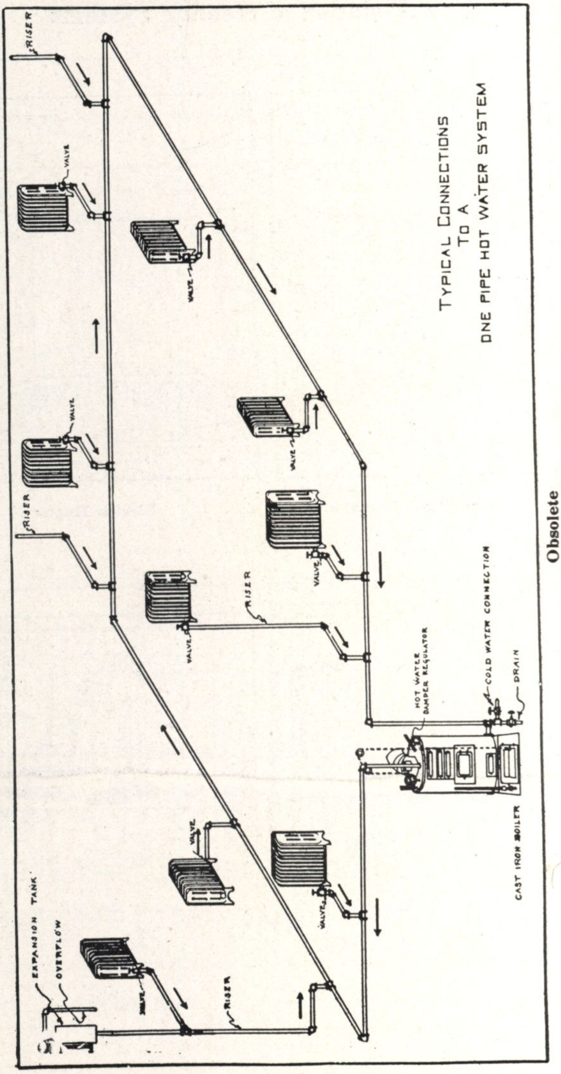
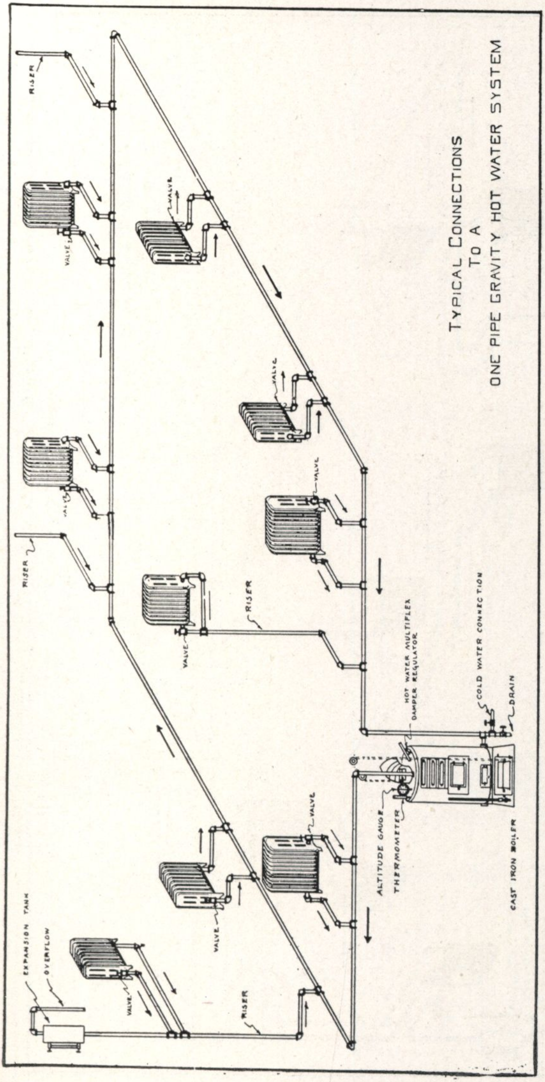


TYPICAL CONNECTIONS
TO A
ONE PIPE HOT WATER SYSTEM

Obsolete

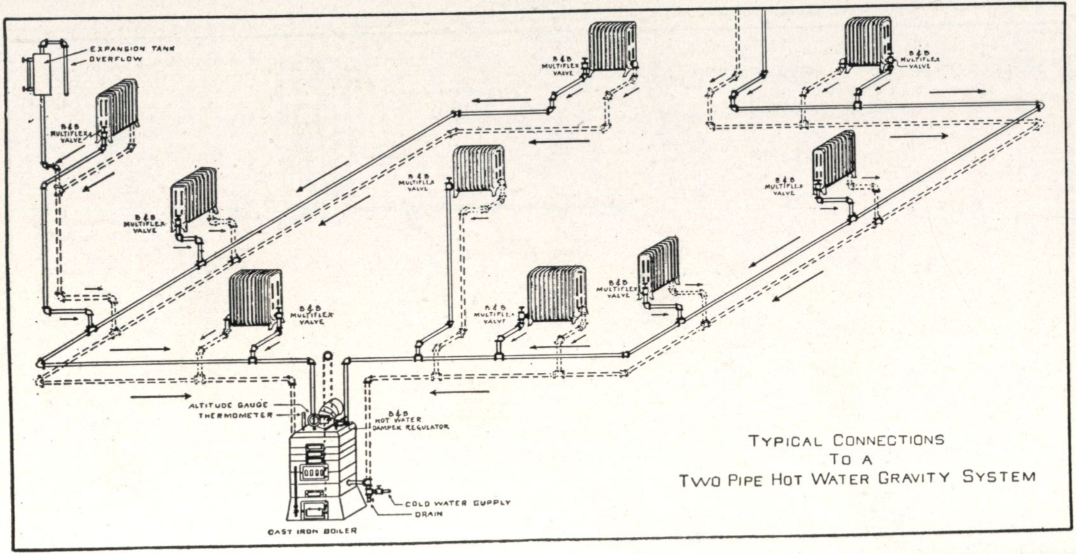
The Evolution of Heating Systems



TYPICAL CONNECTIONS
TO A
ONE PIPE GRAVITY HOT WATER SYSTEM

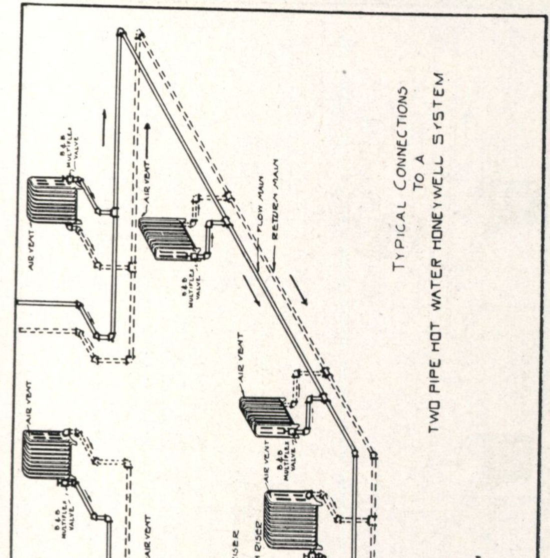
Obsolete

The Evolution of Heating Systems



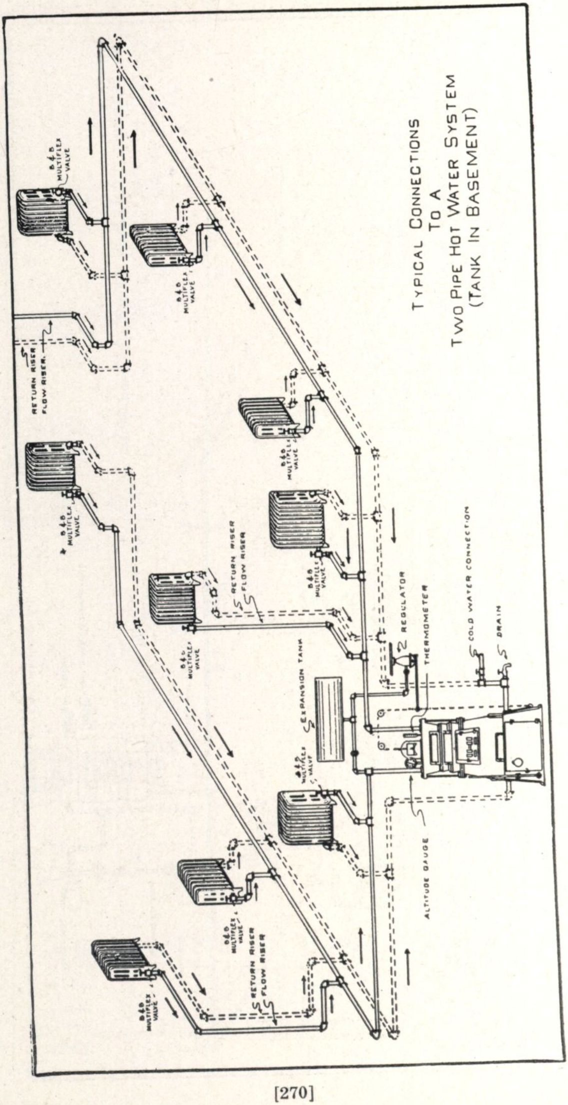
TYPICAL CONNECTIONS TO A TWO PIPE HOT WATER GRAVITY SYSTEM

The Evolution of Heating Systems



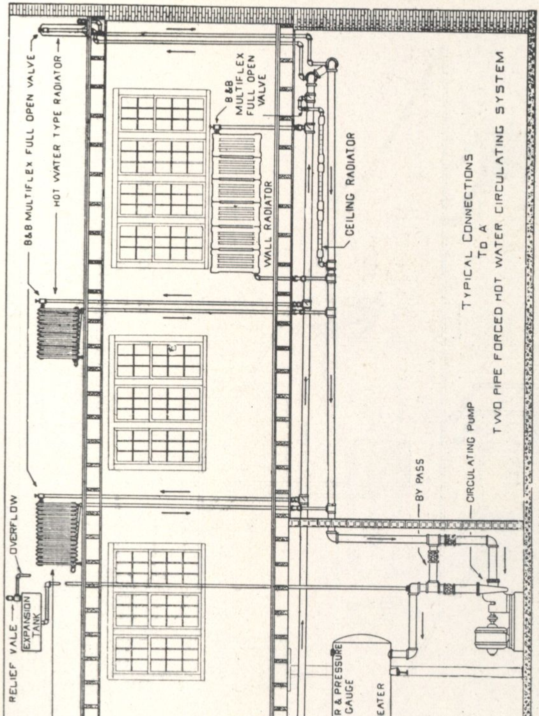
TYPICAL CONNECTIONS TO A TWO PIPE HOT WATER HONEYWELL SYSTEM

The Evolution of Heating Systems



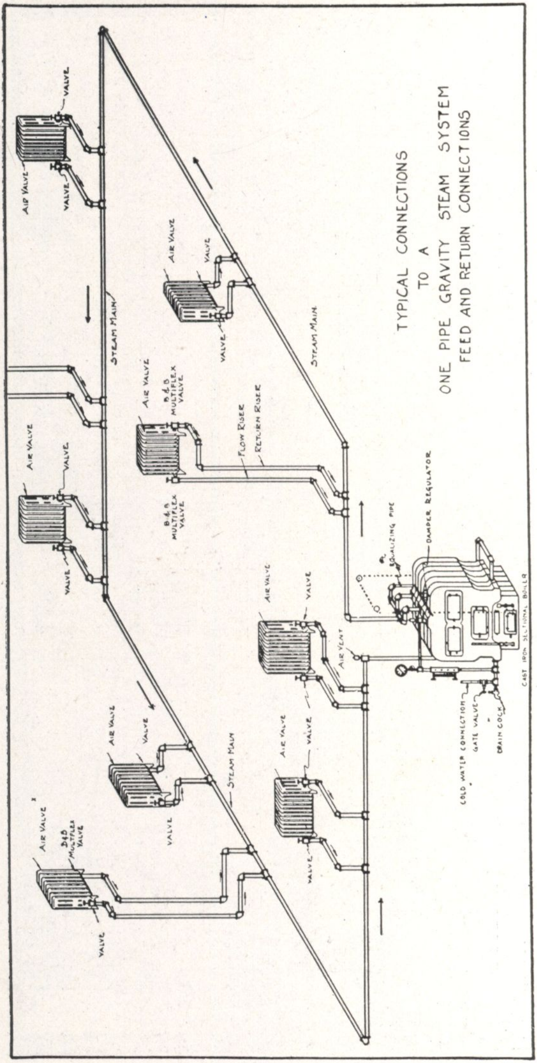
TYPICAL CONNECTIONS
TO A
TWO PIPE HOT WATER SYSTEM
(TANK IN BASEMENT)

The Evolution of Heating Systems



TYPICAL CONNECTIONS TO A TWO PIPE FORCED HOT WATER CIRCULATING SYSTEM

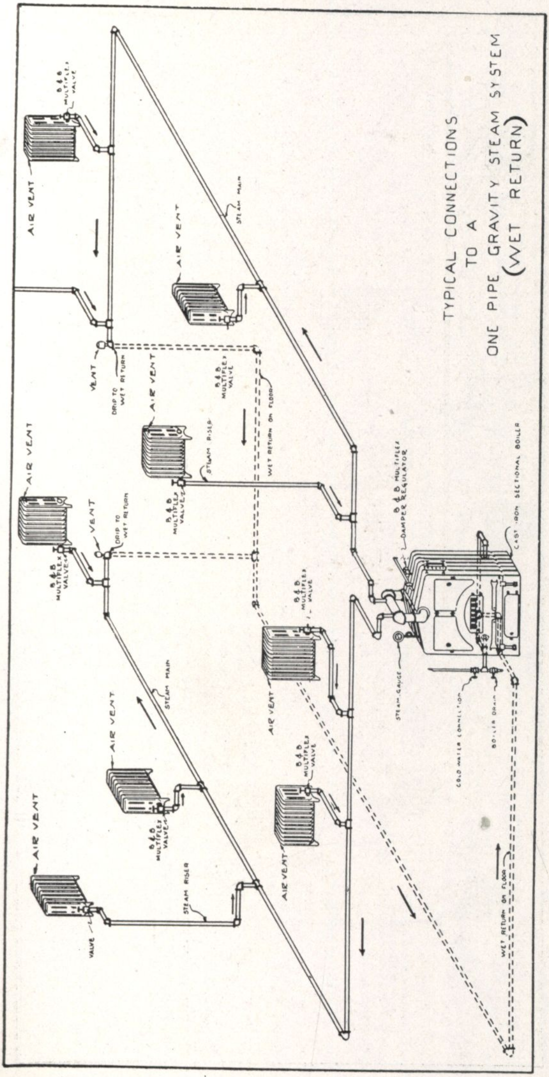
The Evolution of Heating Systems



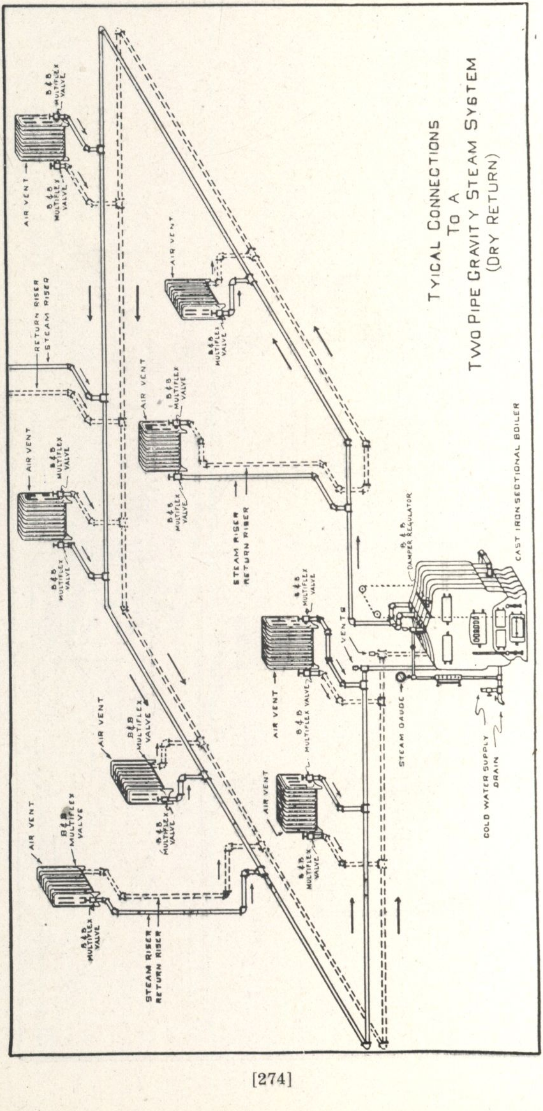
TYPICAL CONNECTIONS
TO A
ONE PIPE GRAVITY STEAM SYSTEM
FEED AND RETURN CONNECTIONS

Obsolete

The Evolution of Heating Systems



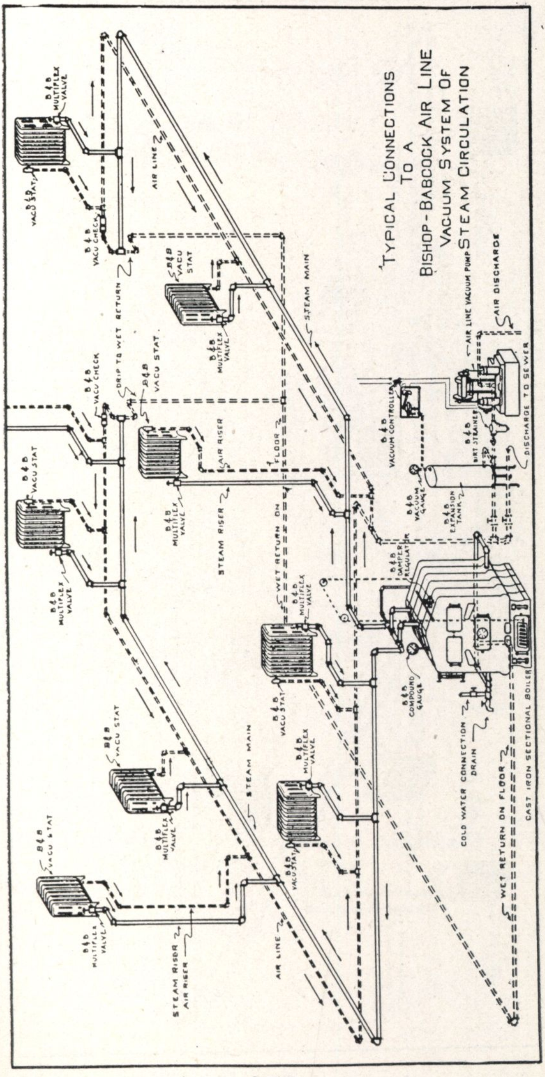
The Evolution of Heating Systems



TYICAL CONNECTIONS
TO A
TWO PIPE GRAVITY STEAM SYSTEM
(DRY RETURN)

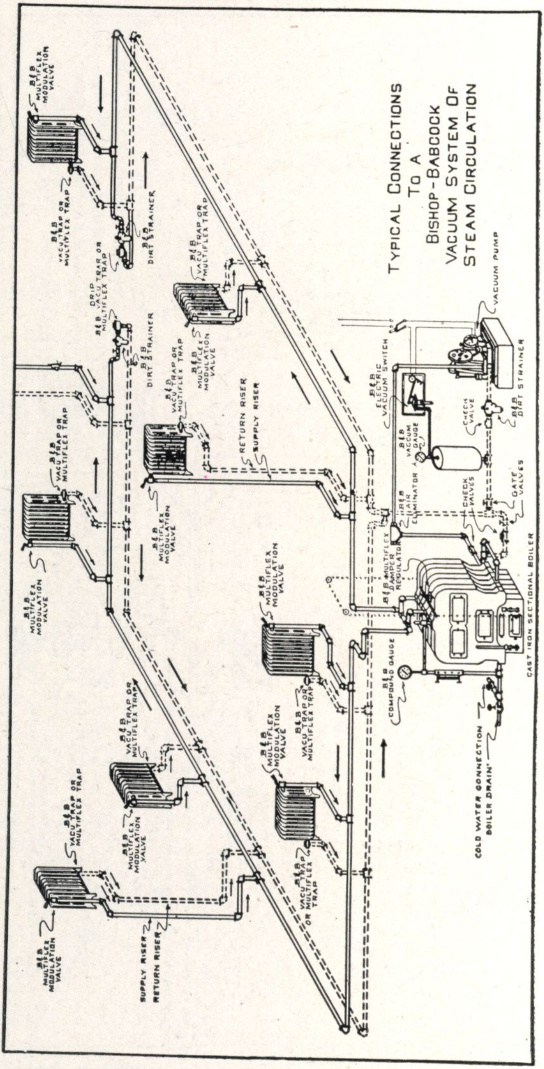
Typical Details

Modern Heating Systems



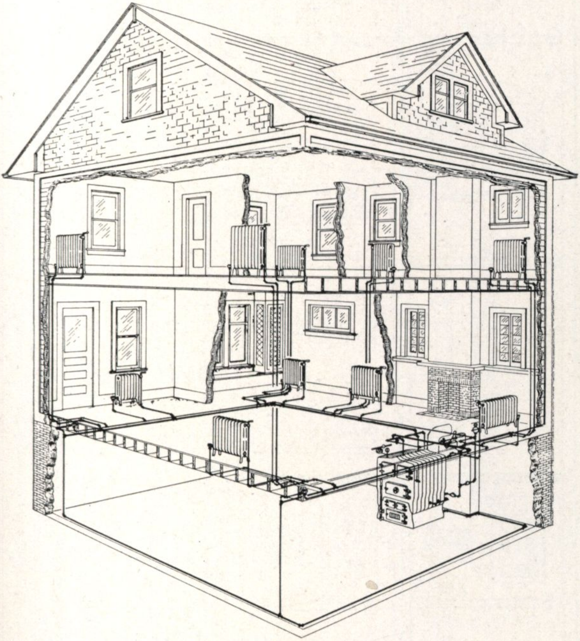
Typical Details

Modern Heating Systems


TYPICAL CONNECTIONS TO A BISHOP-BABCOCK VACUUM SYSTEM OF STEAM CIRCULATION
B&B MULTIFLEX MODULATION VALVE
B&B VACU TRAP OR MULTIFLEX TRAP
B&B DRIP VACU TRAP OR MULTIFLEX TRAP
B&B DIRT STRAINER
RETURN RISER
SUPPLY RISER
VACUUM PUMP
B&B DIRT STRAINER
CHECK VALVE
B&B ELECTRIC VACUUM SWITCH
B&B VACUUM GAUGE
B&B AIR ELIMINATOR
CHECK VALVES
GATE VALVES
B&B MULTIFLEX DAMPER REGULATOR
CAST IRON SECTIONAL BOILER
B&B COMPOUND GAUGE
COLD WATER CONNECTION
BOILER DRAIN
SUPPLY RISER
RETURN RISER

Typical Details

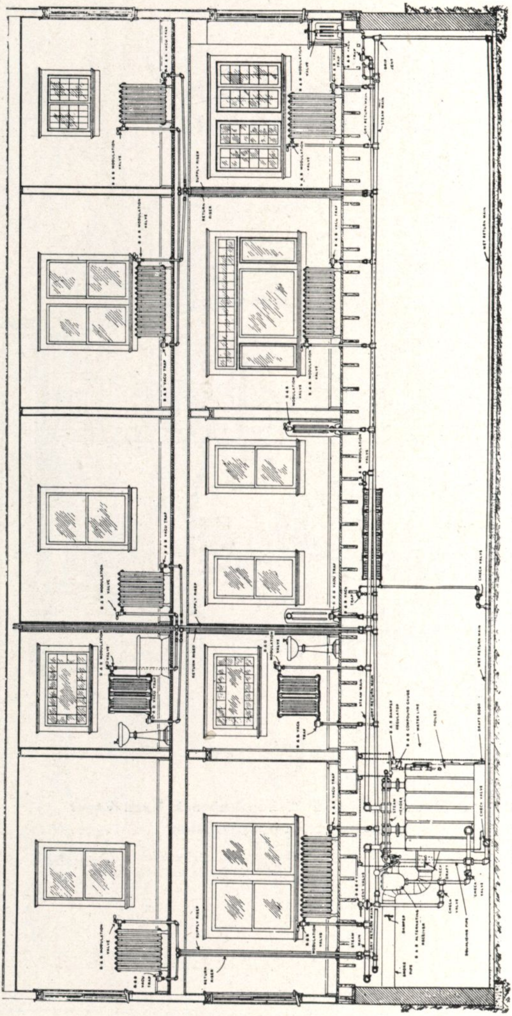
Modern Heating Systems



Typical Installation of a Bishop-Babcock Vacu-Vapor System of Steam Circulation

Typical Details

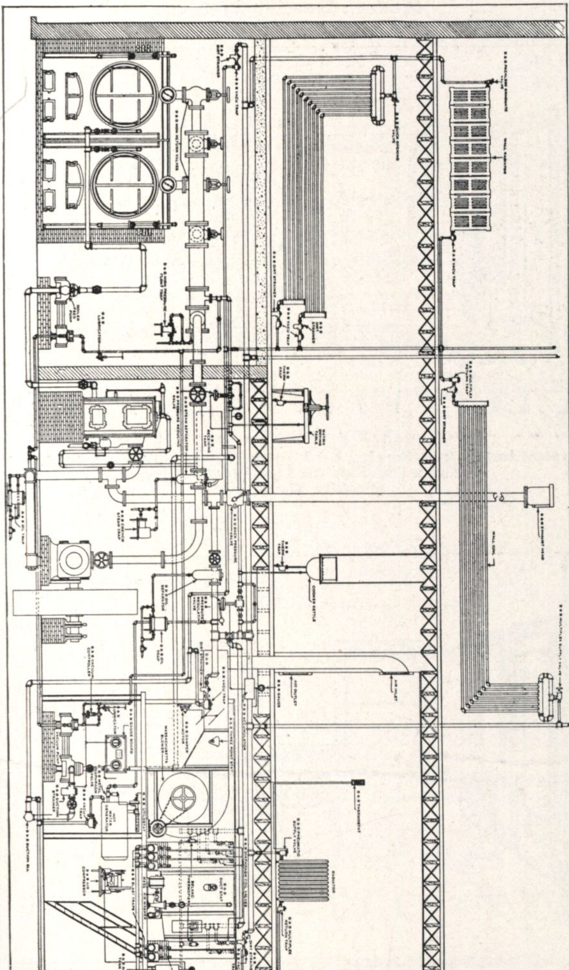
Modern Heating Systems



Typical Connections to a Bishop-Babcock Vacu-Vapor System of Steam Circulation

Typical Details

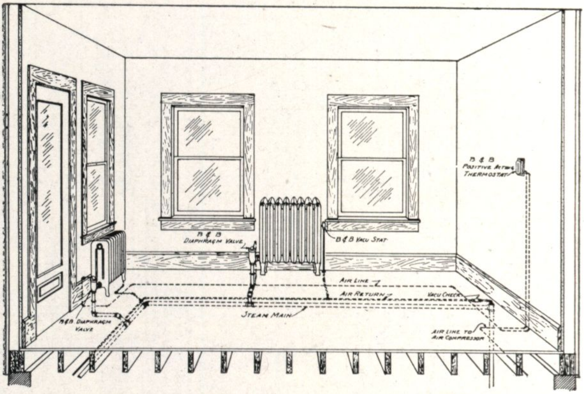
Modern Heating Systems



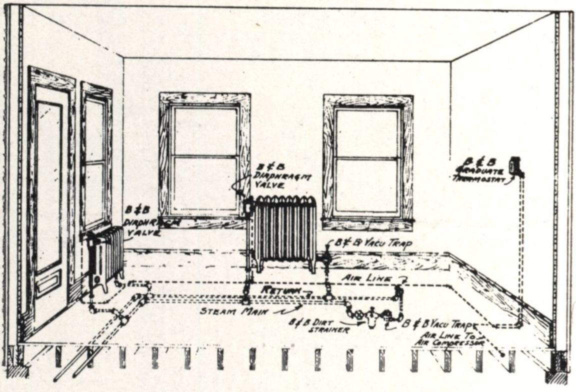
Typical Connections to a Bishop-Babcock Vacuum System of Steam Circulation—Using Exhaust Steam

Typical Details

Modern Heating Systems



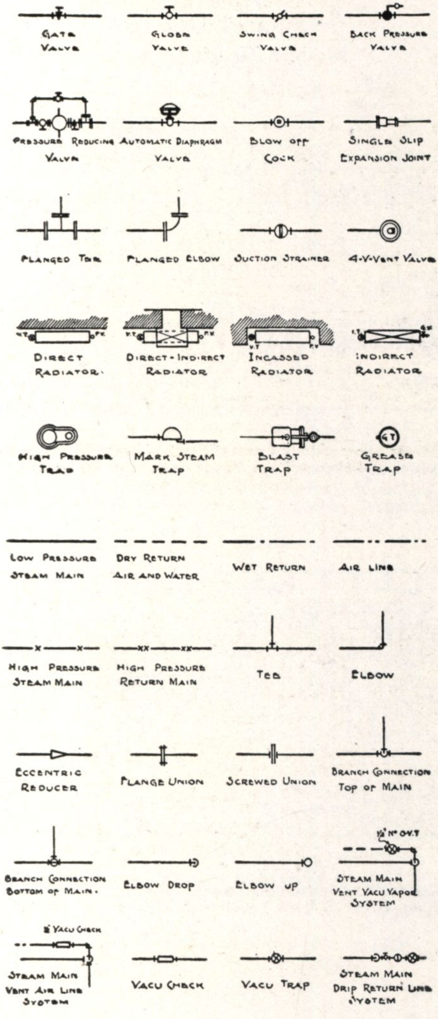
Typical Installation Showing B&B Temperature Control in Connection With a One Pipe Air Line Vacuum System (Positive Thermostat)



Typical Installation Showing B&B Temperature Control in Connection With a Two Pipe Vacuum System (Graduate Thermostat)

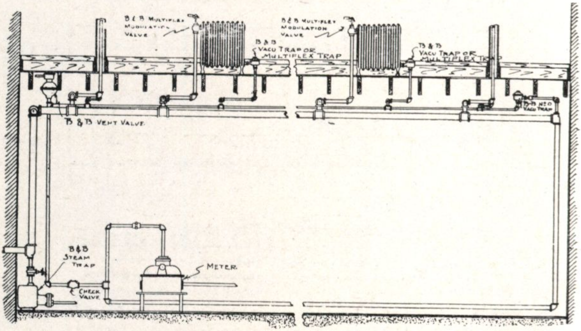
Typical Details

Standard Symbols for Heating and Ventilating Plans

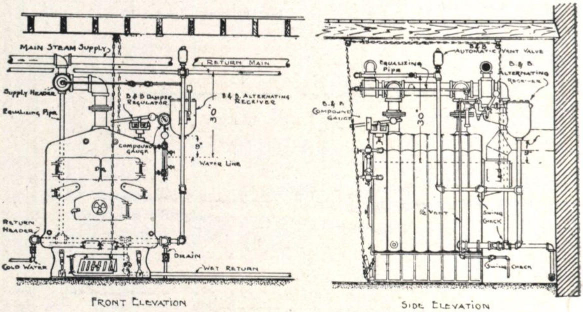


Typical Details

Modern Heating Systems


B & B Multiflex Modulation Valve
B & B Multiflex Modulation Valve
B & B Vacu Trap or Multiflex Trap
B & B Vacu Trap or Multiflex Trap
B & B Vent Valve
B & B No. O Vacu Trap
B&B Steam Trap
Check Valve
Meter

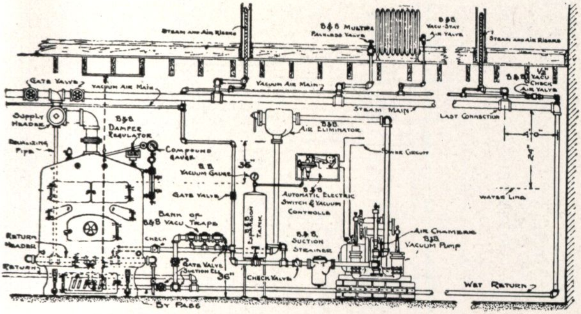
Typical Meter Connections Central Station Steam Service as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation



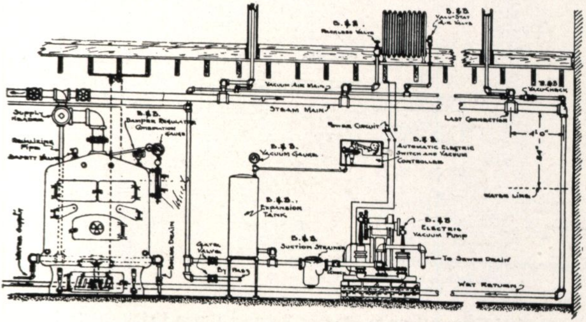
Typical Connections to B&B Alternating Receiver as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation

Typical Details

Modern Heating Systems

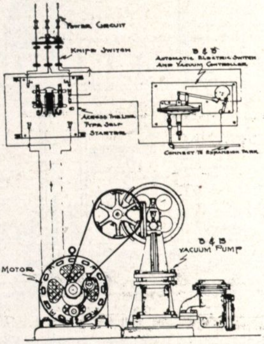


Typical Connections to a Bishop-Babcock Combination Air Line and Return Vacuum System of Steam Circulation

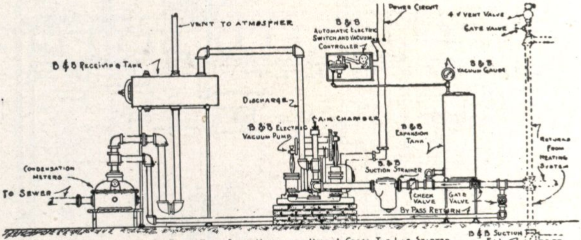


Typical Connections to the Bishop-Babcock Air Line Vacuum System of Steam Circulation

Typical Details


Power Circuit
Knife Switch
B & B
Automatic Electric Switch
And Vacuum Controller
Across The Line Type Self Starter
Connect to Expansion Tank
B & B
Vacuum Pump
Motor

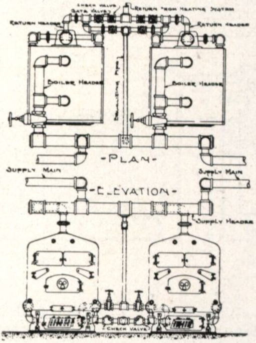
Typical Wiring Diagram for Vacuum Regulator and Across the Line Type Self Starter as Applied to (Three Phase Motors)



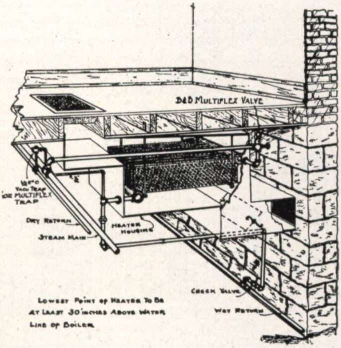
Note:- When Two or Three Phase Motors are Used A Cross The Line Starter Must Be Used in Connection with Above Automatic Electric Switch & Vacuum Controller.

Typical Connections to Electric Vacuum Pump Using Central Station Steam Service

Typical Details

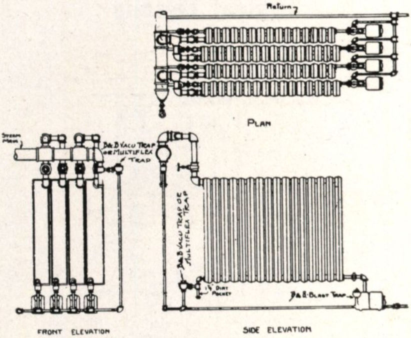


Typical Connections to Two Cast Iron Boilers


B&B Multiflex Valve
½"O Vacu Trap or Multiflex Trap
Dry Return
Heater Housing
Steam Main
Check Valve
Lowest Point of Heater to Be at Least 30 inches Above Water Line of Boiler
Wet Return

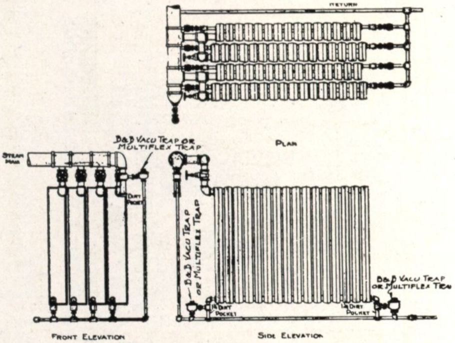
Typical Connections to Indirect Radiator as Applied to B&B Vacu Vapor Systems of Steam Circulation

Typical Details



Install swing check in each return if temperature control is used

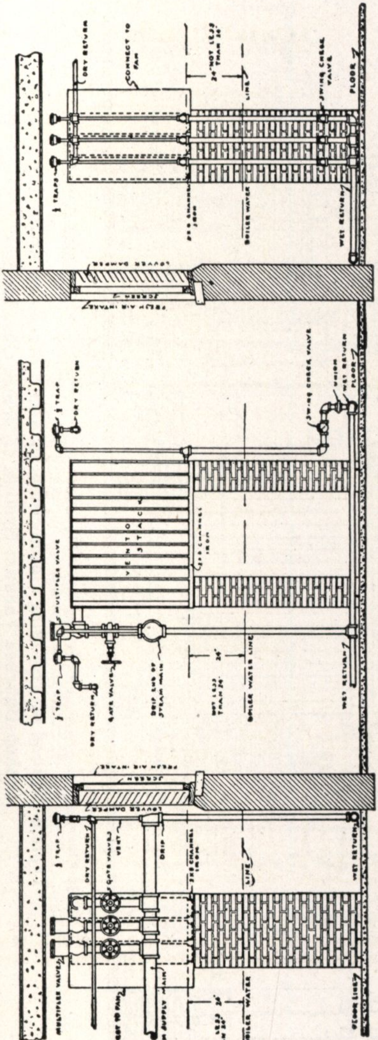
Typical Connections to Vento Heaters Using B&B Blast Traps as Applied to the Bishop-Babcock Vacuum System of Steam Circulation


Return
Plan
Steam Main
B&B Vacu Trap or Multiflex Trap
Dirt Pocket
B&B Vacu Trap or Multiflex Trap
1¼" Dirt Pocket
1¼" Dirt Pocket
B&B Vacu Trap or Multiflex Trap
Front Elevation
Side Elevation

Install swing check in each return if temperature control is used.

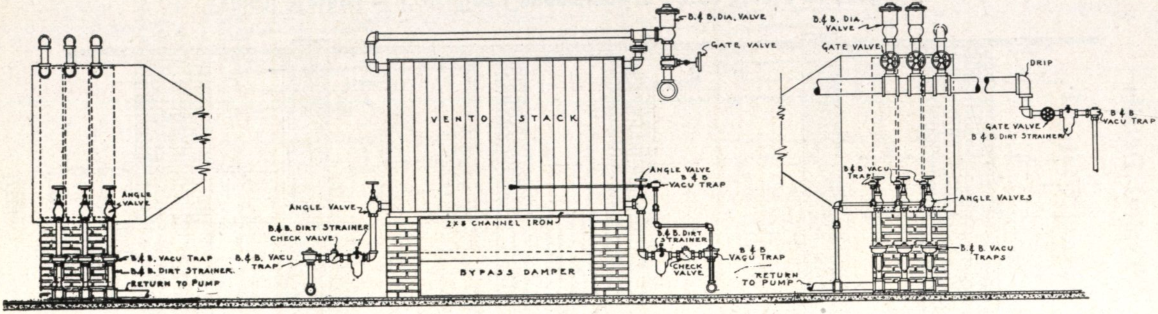
Typical Connections to Vento Heaters Using B&B Multiflex Traps as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

Typical Details



Typical Method of Providing Connections to Vento Stacks as Applied to Bishop-Babcock Vacu-Vapor System of Steam Circulation

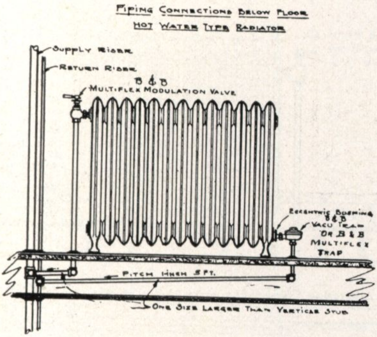
Typical Details



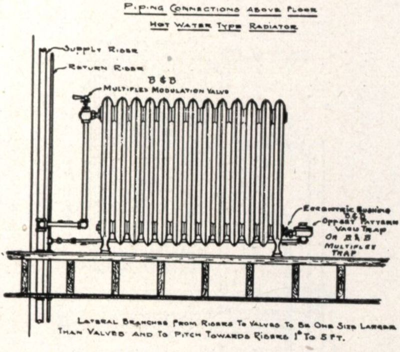
Side Elevation Elevation Side Elevation

Typical Method of Providing Connections to Vento Stacks as Applied to Bishop-Babcock Vacuum System of Steam Circulation

Typical Details

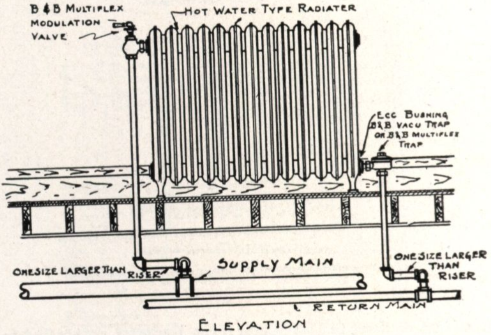


Typical Connections to Hot Water Type Radiator as Applied to the Bishop-Babcock Vacu Vapor or Vacuum System of Steam Circulation

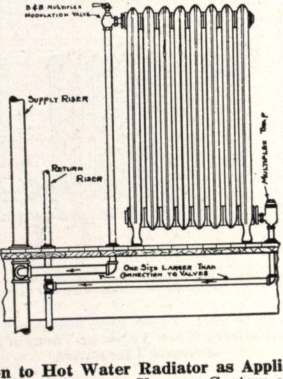

PIPING CONNECTIONS ABOVE FLOOR
HOT WATER TYPE RADIATOR
SUPPLY RISER
RETURN RISER
B & B
MULTIFLEX MODULATION VALVE
ECCENTRIC BUSHING
B & B
OFFSET PATTERN
VACU TRAP
OR B & B
MULTIFLEX
TRAP
LATERAL BRANCHES FROM RISERS TO VALVES TO BE ONE SIZE LARGER THAN VALVES AND TO PITCH TOWARDS RISERS 1" TO 5 FT.

Typical Connections to Hot Water Type Radiators as Applied to the Bishop-Babcock Vacu Vapor or Vacuum System of Steam Circulation

Typical Details

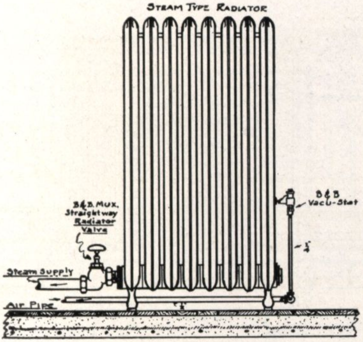


Typical Connections to Hot Water Type Radiator as Applied to the Bishop-Babcock Vacu Vapor or Vacuum System of Steam Circulation

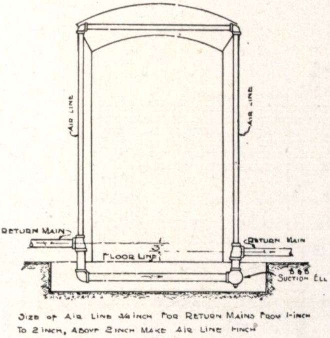


Typical Connection to Hot Water Radiator as Applied to the Bishop-Babcock Vacu Vapor or Vacuum System of Steam Circulation

Typical Details

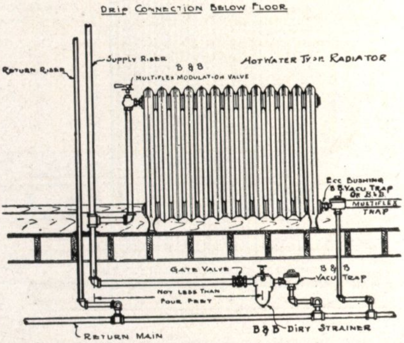


Typical Connections to Steam Type Radiator as Applied to B&B Air Line System of Steam Circulation

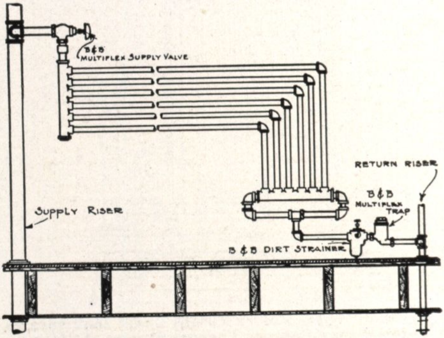

AIR LINE
AIR LINE
RETURN MAIN
RETURN MAIN
3"
FLOOR LINE
B&B
SUCTION ELL
SIZE OF AIR LINE ¾ INCH FOR RETURN MAINS FROM 1-INCH
TO 2 INCH, ABOVE 2 INCH MAKE AIR LINE 1 INCH

Typical Connection Where Return Passes Under Doorways as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

Typical Details

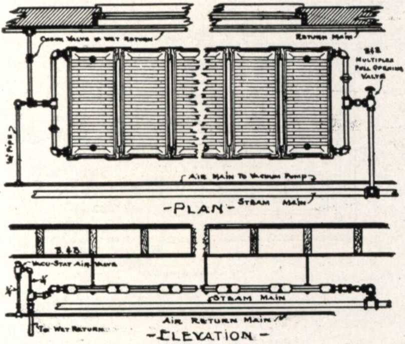


Typical Connections to Hot Water Type Radiator and Drip of Down Feed Riser as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

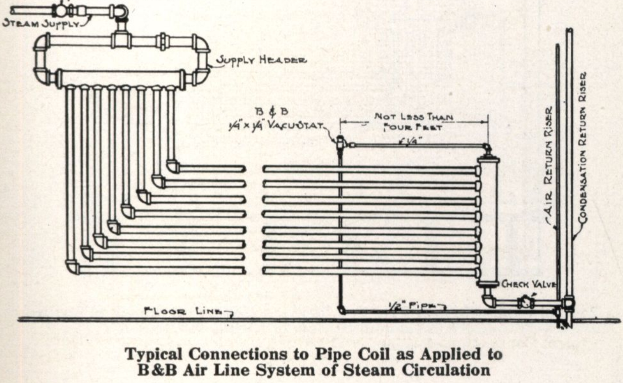


Typical Connections to Pipe Coil Showing Header on Return as Applied to B&B Vacuum System of Steam Circulation

Typical Details

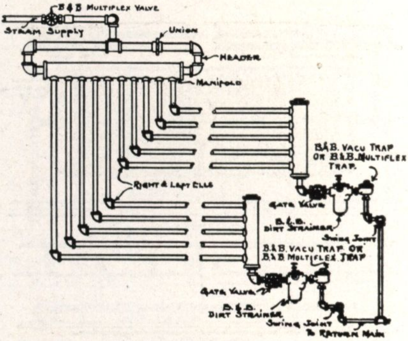


Typical Connections to Wall Type Radiator as Applied to B&B Air Line System of Steam Circulation

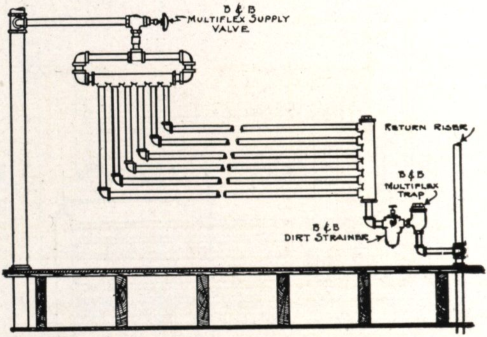


Typical Connections to Pipe Coil as Applied to B&B Air Line System of Steam Circulation

Typical Details

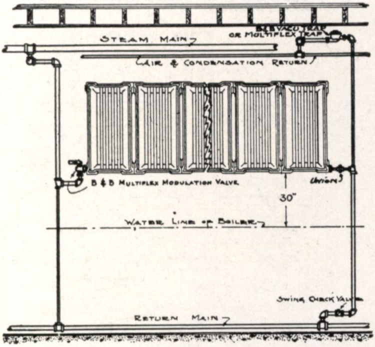


Typical Connections to Pipe Coil of More than 6 Pipes as Applied to B&B Vacuum System of Steam Circulation

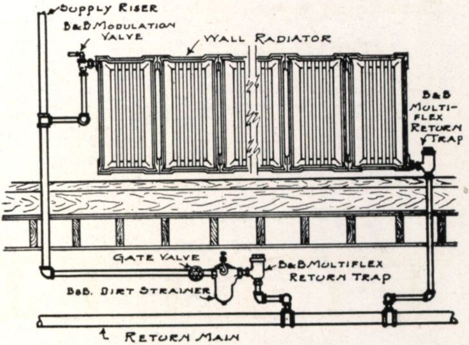


Typical Connections to Pipe Coil Showing Header on Supply as Applied to B&B Vacuum System of Steam Circulation

Typical Details

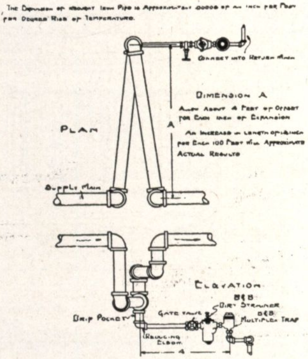

STEAM MAIN
B & B VACU TRAP OR MULTIFLEX TRAP
AIR & CONDENSATION RETURN
B & B MULTIFLEX MODULATION VALVE
Union
30"
WATER LINE OF BOILER
SWING CHECK VALVE
RETURN MAIN

Typical Connections to Wall Type Radiators on Same Floor Level as Boiler as Applied to B&B Vacu Vapor System of Steam Circulation

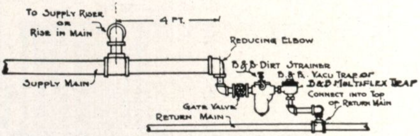


Typical Connections to Wall Type Radiators and Drip on Down Feed Riser as Applied to B&B Vacuum System of Steam Circulation

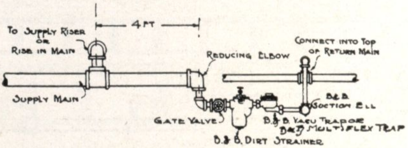
Typical Details


The Expansion of Wrought Iron Pipe is Approximately .00008 of an inch per Foot per Degree Rise of Temperature.
Connect into Return Main
Dimension A
Allow About 4 Feet of Offset for Each Inch of Expansion
An Increase in Length of 1½ Inch for Each 100 Feet Will Approximate Actual Results
Plan
A
Supply Main
Elevation
B&B Dirt Strainer
Gate Valve
B&B Multiplex Trap
Drip Pocket
Reducing Elbow
4

Typical Connections of Expansion Joint for Supply Mains as Applied to the Bishop-Babcock Vacuum System of Steam Circulation


To Supply Riser or Rise in Main
4 FT.
Reducing Elbow
B&B Dirt Strainer
B.&B. Vacu Trap or B&B Multiflex Trap
Supply Main
Connect into Top of Return Main
Gate Valve
Return Main

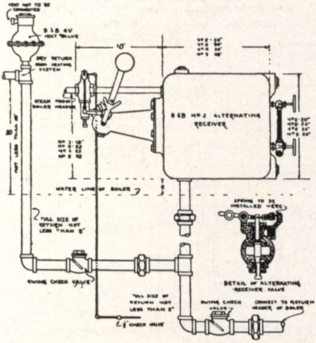
-WHERE RETURN MAIN IS BELOW SUPPLY MAIN-


4 FT
To Supply Riser or Rise in Main
Reducing Elbow
Connect into Top of Return Main
Supply Main
B&B Suction Ell
Gate Valve
B.&B. Vacu Trap or B&B Multiflex Trap
B.&B. Dirt Strainer

-WHERE RETURN IS ON SAME LEVEL OR ABOVE SUPPLY MAIN-

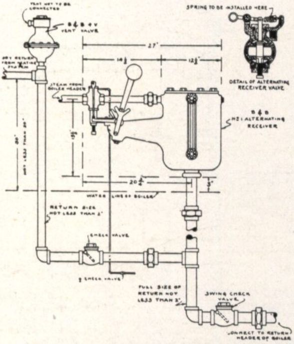
Typical Drip Connections as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

Typical Details


VENT NOT TO BE CONNECTED
B & B 4V VENT VALVE
DRY RETURN FROM HEATING SYSTEM
STEAM FROM BOILER HEADER
10"
B&B No. 2 ALTERNATING RECEIVER
WATER LINE OF BOILER
FULL SIZE OF RETURN NOT LESS THAN 2"
SWING CHECK VALVE
SPRING TO BE INSTALLED HERE
DETAIL OF ALTERNATING RECEIVER VALVE
FULL SIZE OF RETURN NOT LESS THAN 2"
SWING CHECK VALVE
CONNECT TO RETURN HEADER OF BOILER
CHECK VALVE

Typical Connections to the B&B No. 2 Alternating Receiver as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation

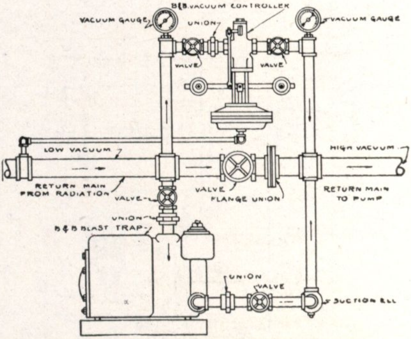
NOTE:—Wet Return Connection to be made only between Lower Check and Boiler.


VENT NOT TO BE CONNECTED
B & B 4V VENT VALVE
DRY RETURN FROM HEATING SYSTEM
27"
14½
12½"
SPRING TO BE INSTALLED HERE
DETAIL OF ALTERNATING RECEIVER VALVE
STEAM FROM BOILER HEADER
B & B No. 1 ALTERNATING RECEIVER
30"
NOT LESS THAN 20"
20¾
3"
WATER LINE OF BOILER
RETURN SIZE NOT LESS THAN 2"
CHECK VALVE
CHECK VALVE
FULL SIZE OF RETURN NOT LESS THAN 2"
SWING CHECK VALVE
CONNECT TO RETURN HEADER OF BOILER

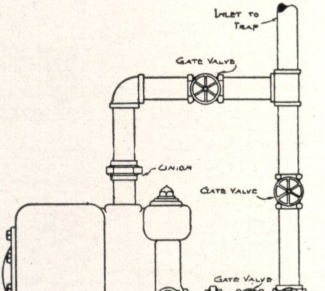
Typical Connections to the B&B No. 1 Alternating Receiver as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation

NOTE:—Wet Return Connection to be made only between Lower Check and Boiler.

Typical Details

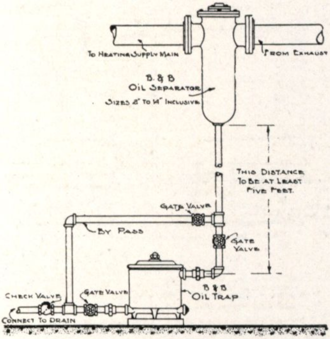


Typical Arrangement of Piping for High and Low Vacuum as Applied to Central Heating Plants

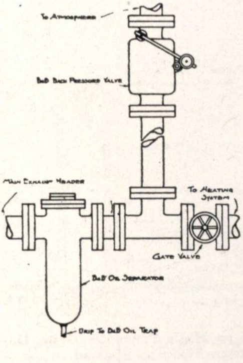


Typical By-Pass Connections to B&B Blast Trap

Typical Details

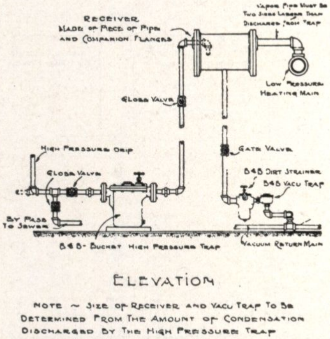


Typical Connection to B&B Oil Separator and B&B Oil Trap as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

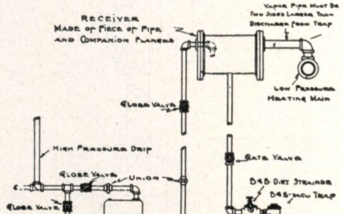


Typical Connections to B&B Back Pressure Valve and B&B Oil Separator as Applied to the Bishop-Babcock Vacuum System of Steam Circulation (Using Exhaust Steam)

Typical Details

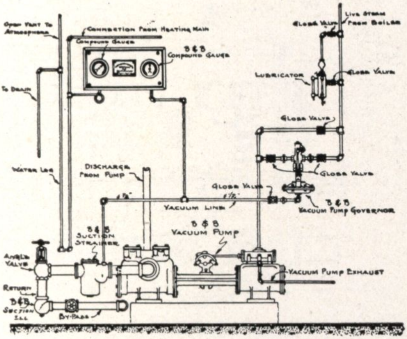


Typical Connections to High Pressure Drip, Low Pressure Drip and Vacuum Return Main as Applied to the Bishop-Babcock Vacuum System of Steam Circulation Using Bucket Type Trap.

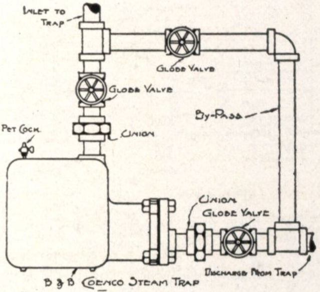


Typical Connections to High Pressure Drip, Low Pressure Drip and Vacuum Return Main as applied to the Bishop-Babcock Vacuum System of Steam Circulation Using A Float Type Trap

Typical Details



Typical Connections to Steam Operated Vacuum Pump as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

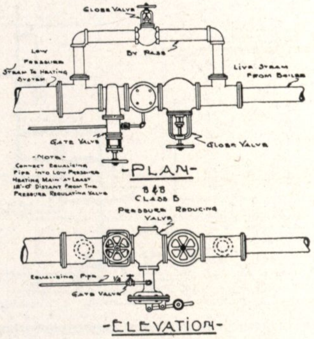


Note:-

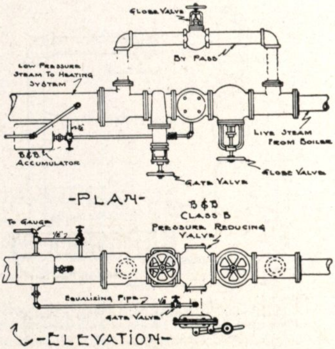
Where (2) Two or More Coenco Steam Traps Discharge into the same line a swing check valve shall be installed on each discharge from trap

Typical By-Pass Connections to B&B High Pressure Float Type of Trap

Typical Details


Globe Valve
By Pass
Low Pressure Steam To Heating System
Live Steam From Boiler
Gate Valve
Globe Valve
-Note-
Connect Equalizing Pipe into Low Pressure Heating Main at Least 18'-0" Distant From The Pressure Regulating Valve
-PLAN-
B&B Class B Pressure Reducing Valve
Equalizing Pipe
1/2"
Gate Valve
-ELEVATION-

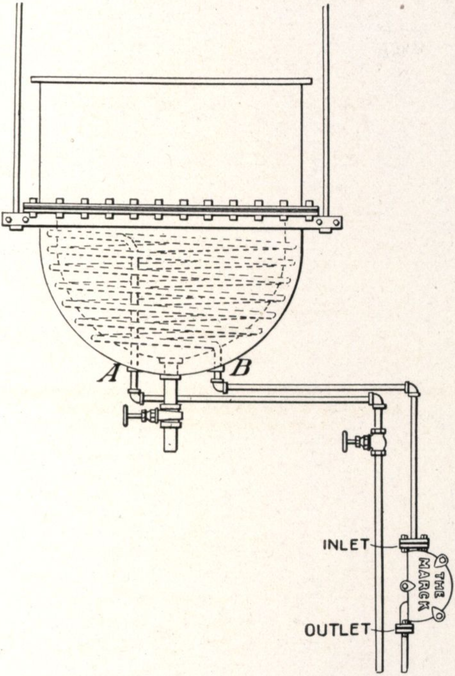
Typical Connections Around the B&B Pressure Regulating Valve as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

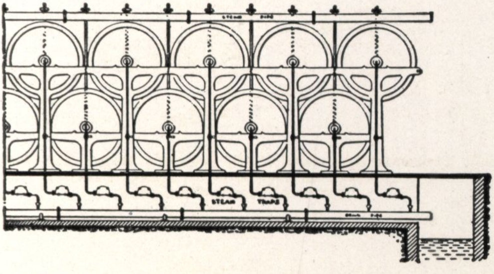


Typical Connections Around B&B Pressure Regulating Valve and Accumulator as Applied to the Bishop-Babcock System of Steam Circulation

Typical Details

Typical Connection Marck Trap to Industrial Apparatus





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